Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

PRODUCT
APROVAL
SPECIFICATION

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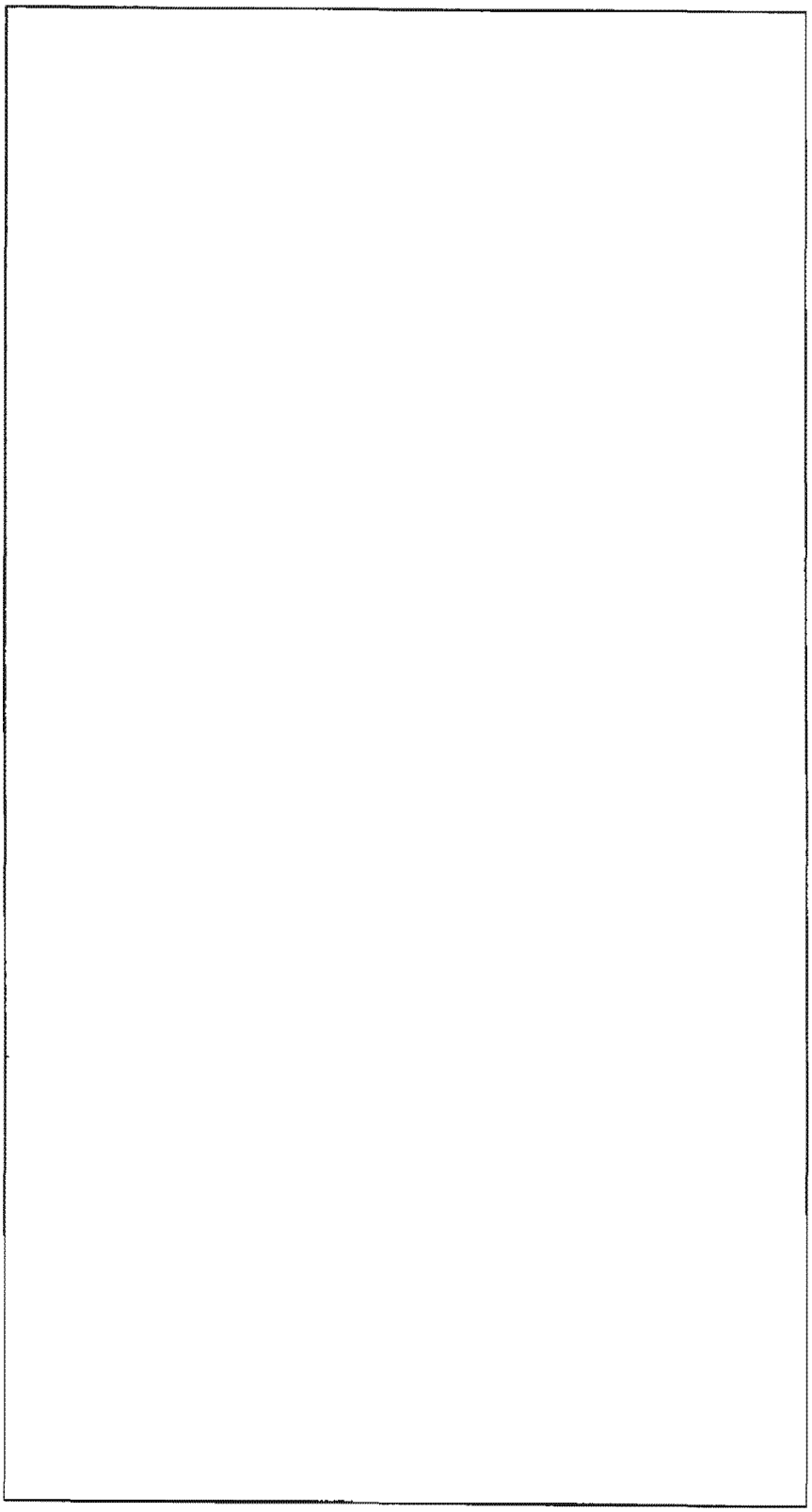

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FOREWORD

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Compliance with this Product Approval Specification does not of itself confer immunity from legal obligations.

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

1 SCOPE

This PAS specifies requirements for non-rewireable 13A fused plugs with plastic socket shutter opening pins, having insulating sleeves on line and neutral pins, for household, commercial and light industrial purposes, with particular reference to safety in normal use.

NB:
The plugs are suitable for the connection of portable Class II products in a.c. circuits only, operating at voltages not exceeding 250 V, at 50 Hz.

Class II products are those which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions such as double insulation or reinforced insulation are provided. There is no provision for earthing.

Requirements are specified for plugs incorporating a fuse-link complying with BS 1362.

Plugs containing switches and devices other than indicator lamps are outside the scope of this Specification.

Plugs are intended for use with flexible cords having conductor cross-sectional areas not exceeding 1.5 mm^2 as referred to in 16.2.

2 CONDITIONS OF USE

Plugs shall be suitable for use under the following conditions:

(a) an ambient temperature in the range -5° to +35°C, the average value of 24h not exceeding 25°C;

NOTE:

under normal conditions of use, the available cooling air is subject to natural atmospheric variations of temperature and hence the peak temperature occurs only occasionally during the hot season, and on those days when it does occur it does not persist of lengthy periods.

(b) a situation not subject to exposure to direct radiation from the sun or other source of heat likely to raise temperatures above the limits specified in (a);

(c) an altitude not exceeding 2000m above sea level;

(d) an atmosphere not subject to abnormal pollution by smoke, chemical fumes, rain, spray, prolonged periods of high humidity or other abnormal conditions.

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3 DEFINITIONS

For the purposes of this Specification, the following definitions apply:

3.1	accessory	a device associated with the wiring of an installation
3.2	rough-use accessory	an accessory designed to withstand severe mechanical handling

NOTE:

Rough-use plugs are identified by additional marking in accordance with 7.1(d). They are not intended for gross misuse. For instance, a plug should not be withdrawn from a socket-outlet by pulling on the attached flexible cord.

3.3	non-rewireable accessory	an accessory so constructed that it forms a constructional unit with the flexible cord such that the flexible cord cannot be separated from the accessory without making it permanently useless, and the accessory cannot be opened by hand or by using a general purpose tool, eg, a screwdriver and/or pliers, without making the accessory permanently useless

NOTE:

An accessory is considered to be permanently useless when, for reassembly of the accessory, parts or materials other than the original need to be used. This does not apply to the replacement of a fuse-link.

3.4	moulded-on accessory	a non-rewireable accessory, the manufacture of which is completed by insulating material moulded around pre-assembled component parts and the terminations of the flexible cord
3.5	fused accessory	an accessory having provision, internally, for a replaceable cartridge fuse-link
3.6	plug	a portable fused accessory having projecting pins designed to engage with the contacts of a corresponding socket outlet. A plug also incorporates means for the electrical connection and the mechanical retention of a suitable flexible cord
3.7	socket outlet	an accessory having a set of three socket-contacts designed to engage with the pins of a appropriate cables or flexible cords
3.8	fixed socket-outlet	an accessory which with its associated enclosure is intended for use mounted in or on a fixed surface
3.9	surface-mounted socket-outlet	a socket-outlet which is intended to be mounted on a wall or other flat surface without the need for recessing

3.10	flush-mounted socket-outlet	a socket-outlet which is intended to be mounted in a box which is recessed into a wall or other flat surface. The socket-outlet plate and the socket-outlet base are regarded as forming a complete unit, and the socket-outlet place is mounted with its back either flush with a wall or other flat-surfaced structure, or flush with the front of a socket-outlet box or enclosure
3.11	panel-mounted socket-outlet	a socket-outlet intended for incorporation .into equipment panels or electrical trunking and which depends upon such incorporation for its enclosure
3.12	portable socket-outlet	a socket-outlet designed for connection to a flexible cord so that the complete socket-outlet may be used without mounting to a fixed surface or structure
3.13	switched socket-outlet	a socket-outlet with an associated switch to disconnect the supply to the line socket contact or to both line and neutral socket contacts
3.14	multiple socket-outlet	a combination of two or more socket-outlets
3.15	socket-outlet base	that part of the socket-outlet which carries the contacts. It may be integral with the socket-outlet plate
3.16	socket-outlet plate	the external plate which covers the base and contact assembly of a socket-outlet and through which the pins of the plug are inserted
3.17	socket-outlet box or enclosure	a box or enclosure suitable for mounting one or more socket-outlets
3.18	shutter	a moveable device arranged to shield the current carrying socket-outlet contacts automatically when a corresponding plug is removed
3.19	actuating member	that part which is moved, eg, pulled, pushed or turned by the user to operate the switch mechanism
3.20	indicator lamp (pilot lamp)	a lamp which illuminates to indicate that the accessory is energized
3.21	terminal	a means by which the user can make an electrical connection between the appropriate cable or flexible cord and the conducting parts of the accessory without the use of special tools
3.22	screw-type terminal	a terminal in which the connection is made directly or indirectly by means of screws or nuts of any kind

NOTE:

The following are examples of screw-type terminals:

(a) a pillar terminal is a terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of the screw or screws

The clamping pressure may be applied directly by the shank of the screw or through an intermediate member to which pressure is applied by the shank of the screw or screws.

(b) A screw terminal is a terminal in which the conductor is clamped under the head of the screw.

The clamping pressure may be applied directly by the head of the screw or through an intermediate part, such as a washer, clamping plate or anti-spread device

(c) a stud terminal in which the conductor is clamped under a nut

The clamping pressure may be applied directly by a suitably shaped nut or through an intermediate, such as a washer, clamping plate or anti-spread device.

3.23	termination	a means by which an electrical connection can be made between the appropriate cable or flexible cord and the conducting part of the accessory using special purpose tools, eg, soldering, welding, crimping.
3.24	fuse carrier	a movable or removable part designed to carry, retain, cover and/or remove the fuse-link
3.25	type test	a test of one or more plugs to show that all plugs made to the same specification and having the same essential details, would pass an identical test
3.26	accessible external surface of a plug	all surfaces which can be touched by test finger Test Probe B of BS 3042: 1992 when the plug is in full engagement with a corresponding socket-outlet
3.27	accessible external surface of a socket-outlet	all surfaces of a socket-outlet which can be touched by test finger Test Probe B of BS 3042 : 1992 when the socket is installed as in use
3.28	live parts	current-carrying parts and those metal parts in contact with them during normal use

NOTE:

Metal parts of the earthing circuit are not considered to be current-carrying parts.

3.29	fine wire thermocouple	a thermocouple having wires not exceeding 0.3mm in diameter
3.30	calibrated link	a calibrated heat source for use in place of a fuse link during temperature-rise tests
3.31	clamp type (screwless) terminal	a terminal in which the connection is made by clamping the conductor of a flexible cable or cord between two metallic surfaces without the use of a screw.

4 GENERAL REQUIREMENTS

Plugs shall be so designed and constructed that in normal use their performance is reliable and without danger to the user or to the surroundings.

Plugs purporting to comply with this Specification shall be capable of meeting all the relevant requirements and tests specified in this Specification.

Gauges to figures 5, 11, 12, 14 and 16 shall be considered to comply with the dimensional requirements if the results of measurements fall within the specified dimensions and the uncertainty of measurement does not exceed ± 0.005 mm.

NOTE:

Where tolerances are not specified in this PAS the values are to be regarded as nominal.

5 GENERAL CONDITIONS FOR TYPE TESTING

5.1 All tests are type tests.

Unless otherwise specified in this PAS the plugs shall be tested as delivered by the manufacturer or responsible vendor and under normal conditions of use, at an ambient temperature of 20 ± 5 C.

The plugs used for the tests shall be substantially identical to normal production items in respect of all details which may affect the test results.

Plugs shall be supplied with an appropriate flexible cord which shall be at least 1m long.

Plugs shall be deemed to comply if no sample fails in the complete series of tests given in Table 1.

If one sample fails in the complete series of tests given in Table 1 and this sample can be shown to be not representative of normal production or design, then a separate set of three samples shall be submitted to the test or tests in that particular group. If there is no failure in this re-test then plugs shall be deemed to comply with this Specification.

NOTE:

Regulation SI 1994 No 1768 does not permit any failures.

5.2 All inspections and tests, of any one classification (see clause 6), shall be carried out as specified in the clauses listed in Table 1 on the number of samples and in the order given.

6 CLASSIFICATION

6.1 Plugs shall be for normal or rough use.

7 MARKING AND LABELLING

7.1 Plugs shall be legibly and durably marked with the following information, which shall not be placed on screws, removable washers or other easily removable parts, or upon parts intended for separate sale.

(a) the BSI Kitemark

(b) the number and date of this PAS, ie PAS 003: 1994

(c) the name or trademark of the manufacturer of responsible vendor

(d) for rough-use plugs the number of the PAS shall be followed by '/A'

(e) the words 'FUSE' or 'FUSED' or the symbol (given in 7.3) on the external accessible surface of a plug

(f) all plugs shall be marked on the engagement surface with the rated current of the fuse-link fitted, which shall not exceed the value given in Table 2 for the appropriate size of flexible cord.

7.1.1 Compliance shall be checked by inspection and by rubbing the markings for 15 s with a cloth soaked in water, and again for 15 s with a cloth soaked in petroleum spirit. The marking shall remain legible. Markings produced by an engraving or moulding process are deemed to comply without test.

7.2 Except where a plug fitted with a flexible cord is supplied directto a manufacturer for incorporation in other equipment, the free end of such an assembly shall have a label attached stating:

(a) 'the flexible cord of this plug must be connected to a piece of Class II equipment before being plugged into a socket-outlet'

(b) the maximum rating, in amperes, of the equipment to which it may be fitted (as given in Table 2)

(c) the colour code of the cores of the flexible cord as follows:

'Wires in the mains lead are coloured in accordance with the following code:

Blue	Neutral
Brown	Live'

(d) 'This lead must not be used with equipment requiring the protection of an earth continuity conductor'

7.2.1 Compliance shall be checked by inspection.

7.3 If symbols are used they shall be as follows:

amperes	A
volts	V
*alternating current	~
live	L
neutral	N
*fuse	

NOTE: BS 6217 gives details of symbols marked *

For the marking of the rated current and rated voltage figures may be used alone, the figures for the current rating being placed before or above that of the rated voltage and separated by a line. If a symbol for nature of supply is used, it shall be placed next to the marking for rated current and rated voltage. Examples are as follows:

13 A 250 V ~
or 13/250 ~

or $\frac{13}{250}$ ~

13 A 250 V a.c.
or 13/250 a.c.

or $\frac{13}{250}$ a.c.

8 CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION

8.1 When the plug is correctly assembled and wired with the appropriate cable or flexible cord the minimum clearance through air and the minimum creepage distance shall be 2.5mm:

(a) between live parts of opposite polarity (the value of 2.5mm is reduced to 1mm for the distance between the lead wires in the pinch of a neon lamp with external resistor);

(b) between live parts and any other metal parts;

(c) between live parts and the accessible external surface of the accessory; ween component parts in the fused line circuit which are separated by the removal of the fuse-link.

Any metal parts of plugs, other than the pins, which are exposed on the engagement face of a plug and are in contact with live parts shall be recessed at least 3.0mm below the engagement face.

When detachable fuse carriers are used on plugs there shall be a minimum gap of 3mm between live metal and the engagement face of the plug, measured with the fuse in position and the carrier omitted.

8.1.1 Compliance shall be checked by inspection and measurement. Movable parts are placed in the most unfavourable position. Nuts and screws with non-circular heads are assumed to have been tightened in the most unfavourable position.

NOTE:

The contribution to the creepage distance of any groove less than 1mm wide is limited to its width; any air gap less than 1mm is ignored in computing the total clearance.

8.2 Plugs shall have either a minimum distance of 2mm through insulation between live parts and the accessible external surface or the minimum distance shall be made up of 2mm through air and 1mm insulation, provided the parts are located such that there is no likelihood of the distance through air being reduced by distortion or movement of the parts.

NOTE:

The insulating sleeving of plug pins and any flexible cord connected to an accessory are excluded from these requirements.

8.2.1 Compliance shall be checked by inspection and measurement and by the following test.

Immediately after the temperature-rise of clause 15, and while the accessory is still hot, test finger Test Probe 11 of BS 3042 : 1992 is applied to the surface with a force of 30N. This shall not cause the air gap to reduce below 2mm.

9 ACCESSIBILITY OF LIVE PARTS

9.1 Live parts of plugs shall not be accessible when wired as in use and in full engagement in a corresponding socket-outlet.

9.1.1 Compliance shall be checked by the application of Test Probe 12 of BS BS 3042 : 1992 applied with a force of 5N with the plug fitted with a 2-core 0.5mm^2 flexible cord as given in table 14 of BS 6500 : 1990.

9.2 Plugs shall be designed and constructed so as to protect the user against accidental contact with live parts during insertion or withdrawal of plugs.

9.2.1 Compliance is proved by satisfying the dimensional and gauging requirements of this PAS.

9.3 Resilient covers of plugs shall be so designed and constructed that when assembled and wired as in normal use, there is no risk that, as a result of undue pressure, live parts could penetrate the cover or become so disposed as to reduce creepage and clearances below those given in clause 8.

9.3.1 Compliance shall be checked by the following test using the apparatus shown in figure 2.

The design of the apparatus shall be such that an even force of 240N can be applied to those places where the possibility of a hazard exists.

Each sample is subjected to the force of 240N can be applied to those places where the possibility of a hazard exists.

Each sample is subjected to the force of 240N at each hazard point in turn, and during each application of a force a 2kV 50Hz test voltage of substantially sinusoidal waveform is applied for 1 min between all live parts bonded together and the earthed test pressure block.

During the test no flashover or breakdown shall occur. After the test it shall not be possible to touch live parts with test finger Test Probe 11 of BS 3042 : 1992 applied with a force of 30N.

9.4 Where a plug is supplied fitted with a flexible cord, the free end of such an assembly shall be encapsulated in insulating material.

NOTE:
This does not apply to assemblies supplied to equipment manufacturers for incorporation into their equipment.

9.4.1 Compliance shall be checked by inspection.

10 PROVISION FOR EARTHING

10.1 Socket earth contact test

The earth continuity of a socket-outlet to BS 1363 : 1984 shall not be impaired by the use of an insulated shutter opening device.

Three different makes of socket-outlet shall be selected, each socket-outlet showing a different design of earth contact.

The socket-outlets selected shall be of a type where the shutter is operated by the insertion of an earth pin of a plug. At least one of the socket-outlets shall have a metal ramp for operating the shutter and at least one shall have a plastic ramp.

Using approved rewireable plugs, the resistance of the earth paths shall be determined as required by sub-clause 10.2.1 (b)(2) of BS 1363 : 1984.

For each socket-outlet a separate plug with an insulated shutter opening device shall be used. The plug is inserted and withdrawn 5000 times at a rate of 6 cycles per minute, the speed of travel being approximately150mm/s.

On completion of 5000 cycles of operation the socket-outlets shall be examined for damage. No damage resulting from the use of the test samples shall be found.

Compliance is checked by repeating the earth resistance test, the same plugs being used as for the initial resistance to earth path tests. The final resistance shall not exceed 0.05ohm. The contacts of the socket-outlets shall be examined to show that there are no deposits of insulating material present which may impair further use.

The insulated socket-opening device shall show no damage which would affect the safety of the plug.

NOTE:

Three additional plugs to those referenced in Table 1 are used for this assessment.

11 TERMINATIONS

11.1 Terminations shall provide for effective clamping and securing of conductors connected to them, so that efficient electrical connection is made.

11.1.1 Compliance shall be checked by inspection in accordance with 11.2 to 11.3.

11.2 Plugs shall be provided with soldered, welded, crimped or similar terminations; screwed and 'snap-on' terminals shall not be used. Crimped connections shall not be made on to pre-soldered flexible cords unless the soldered area is entirely outside the crimp.

For all these methods of termination, no more than one strand, or 5% of the total number of strands of the conductor, whichever is the larger, shall be fractured during connection.

11.2.1 Compliance shall be checked by inspection and measurement.

12 CONSTRUCTION OF PLUGS

12.1 The disposition of the pins shall correspond with that shown for socket contacts in figure 3.

12.1.1 Compliance shall be checked by inspection.

12.2 The outline of the plug shall not exceed the dimensions shown in figure 4 and within these dimensions there shall be no axial projection from the engagement surface of the plug. Pin centres and dimensions shall be shown in figure 4. The maintenance of these dimensions shall not rely on the terminal screws.

12.2.1 Compliance shall be checked by inspection, measurement and by the use of the gauge shown in figure 5.

With the engagement faces of the plug and the gauge parallel to each other, the plug shall enter the gauge when a force of 5N or less is applied to the centre of the plug at right angles to the engagement face and without any additional force being applied to the pins to bring them into alignment.

12.3 No part of a line or neutral pin shall be less than 9.5mm from the periphery of the plug measured along the engagement face.

12.3.1 Compliance shall be checked by measurement.

12.4 A fuse-link complying with BS 1362 shall be provided within the body of the plug and the fuse-link shall be mounted in appropriate contacts only between the line terminal or termination and the corresponding plug pin in such a way that it cannot be displaced when the plug is in use. The design shall be such that the fuse-link cannot be left in inadequate contact when the plug or fuse cover or the fuse-carrier is replaced and firmly secured in position.

It shall be impossible to replace the fuse-link in a plug unless the plug is completely withdrawn from the socket outlet.

The current rating of the fuse-link shall be appropriate to the attached flexible cord (see table 2).

12.4.1 Compliance shall be checked by inspection.

12.5 Where the fuse-link is retained by means of a fuse-carrier, this device shall be either:

(a) non-detachable in normal use; or

(b) readily identifiable in relation to its plug by means of marking

12.5.1 Compliance shall be checked by inspection.

12.6 The base and cover of plugs shall be permanently attached to each other.

12.6.1 Compliance shall be checked by inspection and by the tests described in 12.6.2, carried out after the mechanical strength tests described in clause 17.

12.6.2 Plug pins are clamped together in a suitable jig and subjected to a pull of 60N whilst suspending the cover by means of a 'nest' to suit the plug cover profile. The test is carried out in an oven at a temperature of 70° ± 2° C and the pull applied for 1 min after the temperature has been attained.

After the test it shall not be possible to touch live parts with the test pin shown in figure 1 applied with a force of 5N.

12.7 Plugs shall be so designed and constructed that they cannot readily be deformed to allow access to live parts.

12.7.1 Compliance shall be checked by inspection and by the following test.

Immediately after the test described in 15.1.2, test finger Test Probe 11 of BS 3042 : 1992 is applied to the accessible surface of the plug with a force not exceeding 30N. It shall not be possible to touch live parts.

12.8 Means shall be provided to prevent loose strands of a conductor or current-carrying parts from reducing the minimum insulation thickness requirements between such parts and all accessible external surfaces of the plug.

12.8.1 Compliance shall be checked by inspection and the test described in 14.2.

12.9 Plugs fitted with solid brass line and neutral pins and plastic shutter opening pins shall comply with 12.9.1; plugs fitted with non-solid brass line and neutral pins shall comply with 12.9.2.

12.9.1 All exposed surfaces of solid plug pins shall be smooth and free from burrs or sharp edges and other irregularities which could cause damage or excessive wear to corresponding socket contacts or shutters.

12.9.1.1 Compliance shall be checked by inspection.

12.9.2 Those surfaces of the non-solid pins which are visible when the plug is correctly assembled shall be free of apertures.

12.9.2.1 Compliance shall be checked by inspection.

12.9.3 All seams and joints of non-solid pins shall be closed over their entire length.

12.9.3.1 Compliance shall be checked by inspection and in case of doubt by the test described in B.1.

12.9.4 Plug pins shall have adequate strength to withstand the stresses of normal use.

12.9.4.1 For solid pins, compliance shall be checked by the test described in B.5. After this test the plug shall fit the gauge shown in Figure 5.

For non-solid plug pins, compliance shall be checked by the test described in B.3. After the test the pins shall comply with 12.9.2 and 12.9.3 and the plugs shall fit the gauge shown in Figure 5. Separate samples shall be used to check pins in accordance with the test described in B.2.

12.9.5 Non-solid pins shall not cause excessive wear to socket contacts or shutters.

12.9.5.1 Compliance shall be checked by the tests described in B.4. After the tests the socket-outlets used shall still meet the requirement specified after the test described 18.1.2 of BS 1363, and the plug pins shall remain intact with no openings in the surfaces, joints or seams which will accept the probe described in B.1.

12.9.6 Plug pins shall have adequate mechanical strength to ensure that they cannot be distorted by twisting.

12.9.6.1 Compliance shall be checked by inspection and by the following test.

The plug is clamped in a block as shown in Figure 23. Each pin is twisted about its longitudinal axis by applying a torque of 0.95 N·m for 1 min. The torque tube and its position on the plug pin shall be as shown in figure 33. After each pin has been separately twisted the plug shall fit the gauge shown in figure 5. The test shall then be repeated with each plug pin being twisted in the opposite direction to that of the first test. After this second test the plug shall fit the gauge shown in figure 5.

12.10 The terminations of neutral plug pins shall be formed as one piece with or shall be permanently connected to the pin in such a way that efficient electrical connection is made that cannot work loose in use. This connection shall not be made by means of a screw.

The contact for the fuse-link connected to the line termination shall be formed in one piece with the fixed part of the termination, or be permanently connected to it in such a way that it cannot work loose in normal use, and the other contact for the fuse-link shall be similarly connected to the corresponding plug pin. These connections shall not be made by means of screws.

The line termination shall provide for effectively clamping and securing conductors connected to it so that efficient electrical connection is made with the fuse-link.

12.10.1 Compliance shall be checked by inspection and the tests described in 17.1.3 and 15.1.2.

12.11 Plugs shall be so designed that when fully assembled the pins are adequately retained in position such that there is no likelihood of them becoming detached from the plug during normal use.

12.11.1 Compliance shall be checked by the following test.

After the tests described in clause 17 each pin is subjected for 1 min to a pull of 100 N without jerks in the direction of the major axis. The plug is mounted using the steel plate shown in figure 6. The apparatus is placed within an oven and the pull is applied 1 h after the plug body has attained the test temperature of 70° ± 2° C.

After the test the plug pin shall comply with the gauges shown in figure 5.

12.12 The degree of flexibility of mounting of the plug pins and the angular movement of the pins in the base shall not be excessive.

12.12.1 Compliance shall be checked by inspection and where necessary by the following test.

Plugs shall be checked using the apparatus shown in Figure 7.

The plug is clamped in the mounting block by means of any two of the plug pins in such a manner as to ensure that the face of the plug, from which the plug-pins project, is supported and in contact with the corresponding flat surface of the mounting block. The back of the plug is not supported and does not come into contact with the fixture. The axis of the clamped pins is horizontal.

The unclamped pin shall be tested by applying a deflection force of 4.4 N at the position and in the four directions shown in Figure 8. The test shall be repeated in turn on the other two pins of the plug.

During each test the deflection measured on the scale shall not exceed 3°. After all tests have been completed the plugs shall fit the gauge shown in Figure 5.

12.13 Suitable means shall be provided for withdrawing the plug without subjecting the flexible cord to stress.

12.13.1 Compliance shall be checked by inspection.

12.14 Plugs shall be fitted with flexible cords in accordance with 16.2.

12.14.1 Compliance shall be checked by inspection.

12.15 Conductive component parts of plugs shall be so located and separated that, in normal use, they cannot be displaced so as to adversely the safety or proper operation of the plug.

12.15.1 Compliance shall be checked by inspection and manual manipulation.

12.16 Line and neutral plug pins shall be fitted with insulating sleeves. The dimensions of the pin and sleeve shall fall within those required by Figure 4.

12.16.1 Compliance shall be checked by inspection and by measurement for the pin and sleeve, and by the use of the gauge shown in Figure 5 for compatibility with the socket-outlet.

12.17 Plug pin sleeves shall have adequate electric strength, resistance to abrasion and resistance to deformation due to overheating of pins.

12.17.1 Compliance shall be checked by the tests described in 12.17.2, 12.17.3 and 12.17.4.

12.17.2 A 50 Hz voltage of substantially sinusoidal waveform is applied between each L and N pin and a thin metal strip of 6mm width wrapped around the base of the plug pin sleeve adjacent to the base of the plug. Initially not more that 500 V is applied, the voltage then being raised to 1250 ± 30 V which is maintained for 60 ± 1 s.

During the test no breakdown or flashover shall occur.

12.17.3 The test apparatus for resistance to abrasion (see Figure 8) comprises a horizontally disposed beam pivoted about its centre point. a short length of steel wire, 1 mm in diameter and bent into a U-shape, the base of the U being straight, the surface smooth with no defects, is rigidly attached at both ends to one end of the beam so that the straight part of the wire projects below the beam and is parallel to the axis of the beam pivot. The plug is held in a suitable clamp as shown in Figure 9 in such a position that the straight part of the steel wire rests upon the plug pin at right angles to it and the plug pin slopes downward at an angle of 10° to the horizontal. The beam is loaded so that the wire exerts a force of 4 N on the pin.

The plug is moved backwards and forwards in a horizontal direction in the place of the axis of the beam so that the wire rubs along the pin. The length of pin thus abraded is approximately 9 mm of which approximately 7 mm is over the insulating sleeve.

The plug is moved 10000 times in each direction (20000 movements) at the rate of 30 movements per minute.
The test shall be made on one pin of each plug.

After the test the sleeve shall show no damage which might impair the further use of the plug.

The sleeve shall not have been penetrated or creased and shall satisfy the tests described in 12.17.2. However, abraided brass material which may contaminate the surface of the sleeve shall be removed for the purpose of this test.

12.17.4 A set of three specimen pins is tested by means of the apparatus shown in Figure 10 which has a blade 0.7 mm wide and a radius of 3 mm. The test is made on one pin of each plug not used for the test described in 12.17.3.

A specimen is positioned as shown in Figure 9 and the apparatus is loaded so that the blade exerts a force of 2.5 N on the specimen. The apparatus, complete with specimen, is then placed in a heating cabinet at 200° $^{+0°}_{-5°}$C for a period of 2 h, after which the specimen is removed and immediately cooled by immersion in water at approximately room temperature.

The thickness of the insulation remaining at the point of impression is measured and shall not have been reduced by more than 50%.

13 RESISTANCE TO AGEING AND HUMIDITY

13.1 Plugs shall be resistant to ageing.

13.1.1 Compliance shall be checked by the following test.

The items are suspended freely in a recirculating oven with approximately cubic proportions which is then maintained at a temperature of 70° ± 2° C for 168 h. The chamber shall have ventilating holes in the top and bottom and the ratio of the cross-sectional area of the ventilating holes to the cross-sectional area of the chamber shall be between 1:200 and 1:250. It is recommended that the cabinet be electrically heated.

After the treatment the items are removed from the cabinet and left at room temperature for at least 4 h and then subjected to the tests given in Table 1.

13.2 Plugs shall be proof against humid conditions which may occur in normal use.

13.2.1 Compliance shall be checked by the humidity treatment described below and immediately followed by the tests described in clause 15.

Plugs are tested with 1 m of the flexible cord with which they are supplied.

Vitrified ceramic material, which after 24 h immersion in water has not increased in mass by more that 0.5% after all the moisture has been removed from its surface, shall not be subjected to further tests, providing the resistance to water of the material does not depend on glaze or varnish.

To suit the ambient conditions at the time of test, a convenient temperature, T° C, between 20° C and 30° C, is chosen as a reference temperature. The sample is brought to a temperature of between T° C and T + 4° C and is then placed in a humidity cabinet containing air with a relative humidity maintained between 91% and 95%. The temperature of the air at all positions within the cabinet where samples can be placed shall be kept within 1° C of the chosen value T.

The sample is kept in the cabinet for 48 h.

NOTE 1

In most cases samples may be brought to the chosen reference temperature by keeping them at this temperature for at least 4 h before the humidity treatment.

NOTE 2

A relative humidity of between 91% and 95% can be obtained by placing in the humidity cabinet a saturated solution of potassium nitrate (KNO_3) or sodium sulphate (Na_2SO_4) in water having a sufficiently large contact surface with the air.

In order to achieve the specified conditions within the cabinet it is necessary to ensure constant circulation of the air within the cabinet and, in general, to use a cabinet which is thermally insulated.

The tests described in clause 13 shall be made in the humidity cabinet or in a room where the specified temperature is maintained. Inspection shall not reveal any damage to the sample which would impair its use or safety within the requirements of this specification.

14 INSULATION RESISTANCE AND ELECTRIC STRENGTH

14.1 The insulation resistance and electric strength of plugs shall be adequate.

14.1.1 Compliance shall be checked by the tests described in 14.1.2 and 14.1.3.

14.1.2 The insulation resistance is measured using a d.c voltage of not less that 500 V applied for a sufficient time for the reading of the measuring instrument to become steady. The insulation resistance is measured consecutively between:

(a) line and neutral terminals;

(b) line and neutral terminals connected together and:

(1) a metal foil in contact with the entire accessible external surface;

(2) any metal part of a cord anchorage;

The insulation resistance shall be not less than:

(i) 5 MΩ between parts of opposite polarity;

(ii) 5 MΩ between parts of opposite polarity connected together, and other parts insulated therefrom, including earthed metal;

One pole of neon indicators and the like shall be disconnected before making this test.

These tests shall be made using accessible parts, eg, pins known to be connected to the terminals.

14.1.3 A 50 Hz voltage of substantially sinusoidal waveform is applied as described in 14.1.2. Initially, not more than 1000 V is applied, the voltage then being raised to 2000 ± 60 V. The high voltage source used shall be such that when the output is adjusted to 2000 ± 60 V for 1 min and is then short circuited, the output current is not less that 200 mA. Any overcurrent protection shall not operate at a current less than 100mA.

During the test no flashover or breakdown shall occur.

Glow discharges without drop in voltage are ignored.

One pole of neon indicators and the like is disconnected before making this test.

14.2 Each plug shall withstand a high voltage test, for which the test voltage shall be alternating, applied between all current-carrying parts connected together and a conducting electrode in contact with the entire outer accessible surface, omitting the engagement face. This test shall be carried out at 6kV for a period between 3 s and 5 s.

During the test no breakdown or flashover shall occur.

Glow discharges without drop in voltage are ignored.

15 TEMPERATURE RISE

15.1 Plugs and their surroundings shall not attain excessive temperatures in normal use.

15.1.1 Compliance shall be checked by the tests described in 15.1.2.

The tests shall be carried out at rated voltage.

During the tests temperature rises are measured where overheating might result in a hazard and the values measured shall not exceed the values given in Table 3. Additionally for plugs the temperature rise of the line and neutral plug pins are measured by means of thermocouples using the apparatus shown in Figure 17. Temperature rises are determined by means of fine wire thermocouples so chosen and positioned that they have minimum effect on the temperature of the part under test. The thermocouples are attached by means of a mixture of equal parts of resin adhesive and zinc oxide, by soldering, or by other equally effective means.

If soldering is used, it is essential that care is taken to ensure that the heat from the soldering process does not affect the performance of the accessory and that no electrical connections are bridged by solder.

If, in order to fix thermocouples, a non-rewireable accessory is dissected to give access to the appropriate positions, the removed parts shall be replaced and if necessary shall be cemented in place such that no additional air spaces are created.

15.1.2 Plugs are tested with 1 m of the flexible cord supplied with them at an appropriate test current as given in Table 2. The plug is fitted with a calibrated link, constructed and calibrated in accordance with appendix A, and is mounted in a flat insulating plate as shown in Figure 10. The supply conductors are attached to the line and neutral pins of the plug by means of clamps which also serve to retain the plug in position. The clamp screws are tightened to a torque of 0.8 N m. The assembly is mounted by means of screws in a standard steel flush-mounted socket-outlet box as shown in Figure 1(b) of BS 4662 : 1970 (1989) having an internal depth of 35 ± 1 mm, which is mounted in a test cabinet as shown in Figure 10(a).

The incoming cable and outgoing flexible cord shall enter the test cabinet through holes in the top surface which shall then be sealed to prevent circulation of air.

The incoming cable shall be 2.5 mm^2 2-core and earth PVC insulated and sheathed cable as given in Table 5(a) of BS 6004 : 1991 and shall enter the socket-outlet mounting box through the standard knockout provided. This shall be fitted with a suitable rubber grommet, the point of entry being sealed to prevent the circulation of air.

The length of cable within the socket-outlet box shall be 150 ± 5 mm and the outer sheath and the circuit protective conductor shall be removed to within 20 mm of the point of entry.

The test cabinet shown in Figure 10(a) is then placed in an environment having an ambient temperature of 20° ± 5° C.

The test current shall be passed through the plug and through a load connected to the flexible cord for a minimum continuous period of 4 h, or longer until stability is reached with a maximum of 8 h, stability being taken as less than 1 K rise within 1 h. The temperature rise is calculated by deducting the reference point temperature from the measurement point temperatures recorded (see figures 10 and 10(a) respectively).

NOTE:

If the temperature rise result for the plug line pin clamp is between 35 K to 37 K the calibration of the test equipment should be checked and any error should be taken into consideration. If the results are then not in excess of 35 K the plugs are deemed to comply with this test.

16 CONNECTION OF FLEXIBLE CORDS AND CORD ANCHORAGE

16.1 The entry of the flexible cord shall be between the current-carrying pins at the side of the plug opposite the insulated shutter opening device.

Provision shall be made for the entry and adequate retention of the flexible cord with which the plug is supplied.

The cord anchorage shall be such that the conductors are relieved from strain, including twisting, where they are connected to the terminations.

The cord anchorage shall contain the sheath. Cord anchorages shall either be of insulating material or if of metal shall be provided with an insulating lining fixed to the metal parts.

Methods such as tying the flexible cord into a knot or tying the ends with string or the like shall not be used.

16.1.1 Compliance shall be checked by inspection and by the following test.

The test is carried out with the cord with which the plug is supplied and using the load given in Table 2. The conductors of the flexible cord are severed at the point of termination prior to the test.

The flexible cord is subjected 25 times to the pull given in Table 2. The pulls are applied without jerks in the most unfavourable position, each time for 1 s. Immediately afterwards, the flexible cord is subjected for 1 min to a torque of 0.15 N·m, as near as practicable to the cord entry. During the test the insulation of the flexible cord shall not be damaged.

3750 V is applied for 1 min between the conductors. Breakdown or flashover is considered to indicate damage to the flexible cord.

After the tests the flexible cord shall not have been displaced by more than 2 mm.

For the measurement of longitudinal displacement a mark is made on the cord whilst it is subjected to the pull at a distance of approximately 20 mm from the anchorage before starting the tests. After the test the displacement of the mark on the flexible cord in relation to the cord anchorage is measured whilst the cord is again subject to the pull.

16.2 Plugs shall be fitted with flexible cords complying with BS 6500 or with flexible cords complying with the requirements of the equipment specification to which they may be fitted. Connections shall be as given in Table 4.

16.2.1 Compliance shall be checked by inspection and a continuity test.

16.3 Plugs shall be so designed that the flexible cord is not subjected to excessive bending where it enters the plug.

16.3.1 Compliance shall be checked using an apparatus similar to that shown in Figure 18. The plug is fixed to the oscillating member of the apparatus so that when this is vertical the axis of the flexible cord at the point of entry is vertical and passes through the axis of oscillation.

Samples with flat flexible cords are mounted so that the major axis of the section is parallel to the axis of oscillation.

The flexible cord is loaded with a weight such that the force applied is as given in Table 2.

The distance between the point of entry to the plug and the axis of oscillation is adjusted so that the weight makes the minimum lateral movement as the oscillating member moves. A current appropriate to the cable fitted, as given in table 2, is passed through the line and neutral conductors, the voltage between them being approximately 250 V a.c.

The oscillating member is moved backwards and forwards through an angle of 90°. 45° on either side of the vertical, the number of flexings being 10000 at a rate of 60 per minute. After 5000 flexings, plugs with cords of circular section are turned through 90° about the cord entry centreline.

NOTE:

A flexing is one movement through 90°, either backwards or forwards.

During the test there shall be no interruptions of the current passing through the conductors and no short circuit between them.

After the test the sample shall show no damage except that breakage of no more than 10% of the total number of conductor strands in any core is ignored, provided they have not pierced the insulation.

17 MECHANICAL STRENGTH

17.1 Plugs shall have adequate mechanical strength and be so constructed as to withstand such handling as may be expected in normal use.

17.1.1 Compliance shall be checked by the tests described in 17.1.2 and 17.1.3.

Any decorative cover, cover plates or parts thereof, not providing protection against electric shock, shall be removed prior to testing.

17.1.2 A solid link of stainless steel as shown in Figure 12 is inserted and withdrawn from the fuse clips of a fused accessory 20 times in succession in a normal manner, not in misuse conditions, at a rate not exceeding 10 per minute. A standard fuse-link complying with BS 1362 is then fitted and the appropriate mechanical strength test completed.

17.1.3 Plugs are tested as delivered.

The flexible cords attached to plugs are cut to a length of 150 ± 5 mm measured from the nearest edge of the insulated shutter opening device, precoiled flexible cords being extended before measurement. Plugs are tested in the tumbling barrel shown in Figure 20, falling 500 mm on to a plywood base 10 mm thick. The barrel is turned at a rate of 5 r/min, 10 falls per minute thus taking place.

Only one plug is tested at a time. The number of drops is as follows:

(a) plugs marked PAS 003: 1994 – 2500

(b) plugs marked PAS 003/A: 1994 – 5000

After the test the plug shall show no external damage which might affect the safety and no components shall have become detached. Current-carrying joints shall not have become loose and shall make satisfactory contact. Compliance shall be checked by inspection, the appropriate test described in clause 14, and the gauge shown in Figure 5.

For the repeat test described in clause 14, the conductor insulation and sheath are removed only as far as is necessary for the attachment of a 1 m length of flexible cord of the same type as that already attached to the accessory, the connection being made by means of a connector having a current rating appropriate to that of the flexible cord.

18 SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS

18.1 Rivets used for current-carrying connections shall be locked against loosening, if these connections are subject to torsion in normal use which is likely to loosen the connection.

18.1.1 Compliance shall be checked by inspection and by manual test.

NOTE 1

Spring washers and the like may provide satisfactory locking.

NOTE 2

For rivets a non-circular shank or an appropriate notch may be sufficient.

18.2 Current-carrying parts shall be of brass, copper, phosphor-bronze or other metal at least equivalent with regard to its conductivity, resistance to corrosion.

18.2.1 Compliance shall be checked by inspection and by the relevant tests described in clauses 15 and 21.

19 RESISTANCE TO HEAT

NOTE:

Figure 31 is a diagrammatic representation of the tests described in this clause and in clause 20.

19.1 Plugs shall be resistant to heat.

19.1.1 Compliance shall be checked by the test described in 19.1.2 or 19.1.3.

19.1.2 Samples are kept for 1 h in a heating cabinet maintained at a temperature of 70° ± 2° C.

During the test they shall not undergo any change impairing their further use and sealing compound shall not flow to such an extent that live parts are exposed. A slight displacement of the sealing compound should be disregarded.

After the test the plugs shall still satisfy the tests described in 9.1.1 and 14.1.3.

19.1.3 External parts of resilient material (eg, thermoplastics, rubber, etc) are subjected to a pressure test be means of an apparatus similar to that shown in Figure 14, the test being made in a heating cabinet at a temperature of 70° ± 2° C

The apparatus comprises two steel jaws, having a cylindrical face of 25 mm radius, a width of 15 mm and a length of 50 mm.

The corners of the jaws are rounded with a radius of 2.5 mm.

The plug is clamped between the jaws in such a way that these press against it in the area where it is gripped in normal use, the centreline of the jaws coinciding as nearly as possible with the centre of this area.

The force applied through the jaws is 20 N.

After 1 h, the jaws are removed and the plugs shall satisfy the tests described in 14.1.2(b) and 14.1.3 and the gauge of Figure 5.

19.2 Parts of insulating material shall be sufficiently resistant to heat having particular regard for their location and function in the complete accessory.

19.2.1 Compliance shall be checked as follows:

(a) parts of ceramic material are deemed to comply without testing;

(b) external parts of plugs tested according to 18.1.3 are deemed to comply without further testing;

(c) all other parts of insulating material shall be subjected to the ball pressure test using the apparatus shown in Figure 15.

The test is made in a heating cabinet maintained at the relevant temperature.

For parts of insulating material necessary to retain current-carrying parts in position the test temperature shall be 75° ± 2° C.

For parts of insulating material not necessary to retain current-carrying parts in position, even though they may be in contact with them, the test temperature shall be 75° ± 2°C.

The surface of the part to be tested is placed in the horizontal position and a steel ball of 5 mm diameter is pressed against this surface by a force of 20 N.

The underside of the part being tested is supported to withstand the test force and to minimize the risk of distortion.

The test load and the supporting means are placed in the heating cabinet, for a sufficient time to ensure they have attained the stabilized testing temperature before the test commences. The part to be tested is placed in the heating cabinet for a period of 10 min, before the test load is applied.

After 1 h, the ball is removed from the sample which is then cooled down, by immersion for at least 10 s in water at approximately room temperature.

The diameter of the impression caused by the ball is measured and shall not exceed 2 mm.

20 RESISTANCE TO ABNORMAL HEAT, FIRE AND TRACKING

NOTE:

Figure 21 is a diagrammatic representation of the tests described in clause 19.2.1 and this clause.

20.1 General. Plugs shall be proof against abnormal heat, fire and tracking.

20.1.1 Compliance shall be checked by the tests described in 20.2 and 20.3.

The tests shall not be made on parts of ceramic material or metal.

20.2 Glow-wire test.

The glow-wire test is applied to ensure that an electrically heated test wire under defined test conditions does not cause ignition of insulating parts or to ensure that a part of any insulating material which might be ignited by the heated test wire under defined conditions has a limited time to burn without spreading fire by flame or burning parts or droplets falling down from the tested part.

If the test specified is required to be made at more than one place on the same sample, it is essential that care is taken to ensure that any deterioration caused by previous tests does not affect the result of the test to be made.

NOTE:

These tests should not be carried out on small parts unlikely to be subjected to abnormal heat and whose failure to pass these tests would not materially affect the safety of the accessory.

20.2.1 Test specimen

The test specimen shall be either a complete accessory or, if the test cannot be made on a complete accessory, a suitable part of one cut out for the purpose of the test.

The test specimen is conditioned for 24 h at a temperature in the range 15° C to 35° C and 45% r.h. to 75% r.h.

The test is made on one specimen and, in case of doubt, is repeated on two further specimens.

20.2.2 Test apparatus

20.2.2.1 Glow wire, consisting of a specified loop of 80/20 Ni/Cr (see Figure 25). When forming the loop it is essential that care is taken to avoid fine cracking of the tip.

The glow-wire is electrically heated; the current necessary for heating the tip to a temperature 960° C shall be between 120 A and 150 A.

20.2.2.2 Sheathed fine wire thermocouple, for temperature measurement, having an outside diameter of 0.5 mm.

The wires consist of nickel-chromium and nickel-aluminium, the welding being located inside the sheath.

The sheath consists of a refractory metal, resistant to a temperature of at least 960° C. The thermocouple is arranged in a 0.6 mm diameter pocket hole drilled in the tip of the glow-wire as shown in section A-A of Figure 16.

The thermo-voltages shall comply with the international thermocouple tables given in BS 4937 : Part 4 : 1973 (1981), the characteristics being practically linear. The cold connection is kept in melting ice or in a compensation box.

20.2.2.3 Voltmeter, for measuring the thermo-voltage, having an accuracy of class 0.5, as specified in BS 89.

20.2.2.4 General. The test apparatus shall be so designed that the glow wire is kept horizontal and that a force of 1 N is maintained on the specimen when either the glow-wire or the specimen is moved horizontally towards the other over a distance of at least 7 mm.

NOTE:

An example of that the test apparatus is shown in Figure 26.

20.2.3 Procedure. The test apparatus is placed in a draught-free room in subdued light so that any flame is visable.

Before starting the test, the thermocouple is calibrated at a temperature of 960° C determined by the melting of a 2mm x 2mm chip of pure silver foil (99.8%) having a thickness of 0.06mm which is placed on the upper surface of the tip of the heated glow-wire. The temperature of 960° C is reached when the foil lying flat on the surface just melts.

Allowance is made for the fact that the thermocouple is able to compensate by an axial movement for thermal elongation of the glow-wire.

The specimen is positioned during the test in the most unfavourable position of its normal use (normally with the surface tested in a vertical position). The tip of the glow-wire is applied to the specified surface of the test sample according to the intended use under which a heated or glowing element may come into contact with the test sample.

A piece of white pine-board approximately 10mm thick covered with a single layer of wrapping tissue is positioned 200mm directly beneath the glow-wire where it is applied to the specimen.

NOTE:

Wrapping tissue paper as defined in 6.86 of BS 3203 : 1979 may be used, ie, a soft and strong light-weight wrapping paper of grammage (basic weight) generally between 12 g/m² and 30 g/m². It is primarily intended for protective packaging of delicate articles and for gift wrapping.

The glow-wire is electrically heated to the appropriate test temperature (as given in Table 5) which is measured with the calibrated thermocouple. It is essential that care is taken to ensure that this temperature and the heating current are constant for 60 s before starting the test and that no heat radiation influences the specimen during this period.

The tip of the glow-wire is brought in contact with the specimen and applied for 30 ± 1 s, the heating current being maintained during this period.

The movement of the tip of the glow-wire through the test sample to which it is pressed shall be limited to 7 mm.

If possible, the tip of the glow-wire is applied to flat surfaces and not to grooves, knock-outs, narrow recesses or sharp edges. The tip of the glow-wire is applied where the section is thinnest but not less than 15 mm from the upper edge of the specimen.

After 30 ± 1 s the glow-wire is removed from the specimen, any movement of air which might affect the results of the test and any further heating of the specimen being avoided.

NOTE:

It is necessary to clean the tip of residue of insulating material after each test, eg, by means of a brush.

20.2.4 Measurement and observations. During the application time of the glow-wire and during a period of 30 s from the end of the application time the specimen and the surrounding parts, including the layer under the specimen, are observed.

The time when ignition of the specimen and/or the time when flames extinguish during or after the application time are measured and recorded.

20.2.5 Evaluation of the test results. The specimen is regarded as having passed the glow-wire test if there is no visible flame and no sustained glowing or if flames and glowing at the specimen extinguish within 30 s after the removal of the glow-wire. There shall be no burning of the tissue paper or scorching of the board.

20.2.6 Application of the glow-wire test. The glow-wire test shall be applied to parts made of insulating material at the test temperatures given in Table 5.

20.3 Tracking test

A flat surface of the part to be tested, if possible at least 15 mm x 15 mm in size, is placed in a horizontal position. Two electrodes of platinum with dimensions shown in Figure 18 are placed on the surface of the sample as shown in the figure, so that the rounded edges are in contact with the sample over the whole length. The force exerted on the surface by each electrode is 1 ± 0.05N.

The electrodes are connected to a 50 Hz supply of substantially sinusoidal waveform with a no-load voltage of 175 V. The short-circuit current is adjusted by means of a variable resistor to 1 ± 0.1 A with cos 0 = 0.95 ± 5. An overcurrent relay which will trip when 0.5 A or more has persisted for 2 s is included in the circuit.

The surface of the sample is wetted by allowing drops of a solution of ammonium chloride in distilled water to fall centrally between the electrodes. The solution shall have a resistivity of 395 ± 5Ω cm at 23 ± 1° C corresponding to a concentration of 0.1%. The drops shall have a volume of

$$20 \begin{smallmatrix} +\ 3 \\ -\ 0 \end{smallmatrix} \text{ mm}^3$$

and shall fall a distance of 35 ± 5mm.

The time interval between one drop and the next shall be 30 ± 5 s.

No flashover or breakdown between the electrodes shall occur before 50 drops have fallen.

The test shall be made at three places on the sample.

In case of doubt the test is repeated, if necessary on a new sample.

NOTE:

It is essential that care is taken to ensure to ensure that the electrodes are clean, correctly shaped and correctly positioned before each test is started.

21 RESISTANCE TO EXCESSIVE RESIDUAL STRESSES AND TO RUSTING

21.1 Press-formed or similar current-carrying parts of copper alloy containing less that 80% of copper shall be resistant to failure in use due to brittleness.

Compliance shall be checked by the following test.

21.1.1

The sample is degreased in a suitable alkaline degreasing solution or organic solvent, then immersed in an aqueous solution of mercurous nitrate containing 10 g of $Hg_2(NO_3)_2$ and 10ml of HNO_3 (relative density 1.42) per litre of solution for 30 min at a temperature of 20° ± 5° C.

NOTE:

Attention is drawn to the fact that due precautions should be taken when using these liquids as they are toxic.

After the treatment the sample is washed in running water, any excess mercury wiped off, and the sample is immediately visually examined.

There shall be no cracks visible with normal or corrected vision without additional magnification.

21.2 Ferrous parts, the rusting of which might cause the plug to become unsafe, shall be adequately protected against rusting.

Compliance shall be checked by the following test

All grease is removed from the parts to be tested by immersion in trichloroethane or an equivalent degreasing agent for 10 min. The parts are then immersed for 10 min in a 10% solution of ammonium chloride in water at a temperature of 20° ± 5° C.

Without drying but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of 20° ± 5° C. After the parts have been dried for 10 min in a heating cabinet at a temperature of 100° ± 5° C their surfaces shall show no signs of rust.

NOTE 1

Traces of rust on sharp edges and any yellowish film removeable by rubbing should be ignored.

NOTE 2

For small helical springs and the like, and for parts exposed to abrasion, a layer of grease may provide sufficient protection against rusting. Such parts are only subjected to the test if there is doubt about the effectiveness of the grease film and the test should then be made without previous removal of the grease.

APPENDIX A

The construction and calibration of a calibrated link

A.1 Construction

The calibrated link (see Figure 19) shall employ the following components complying with BS 1362:

(a) ceramic body (as standard);

(b) filling (as standard);

(c) end caps (modified standard cap as shown in figure 19(a)).

The resistive element shall be of copper nickel wire having a resistivity value between 44Ω cm and 49Ω cm. The overall length shall be 25.4 mm and the diameter such as to allow a small reduction in the cross-sectional area to adjust the watts loss to the required value. The ends are turned down to 1.0 mm diameter so that the distance between the shoulders so formed shall be 25.4 mm less twice the end cap end wall thickness (see figure 19(b)).

The resistive element shoulders shall be firmly butted to the inside faces of the end caps and soldered using a tin silver solder, grade 96S as specified in BS 219. The assembly thus formed (see Figure 19(c)) shall be checked for watts loss in accordance with A.2 Metal shall then be carefully filed from the resistive element over as long a length as is possible and the assembly rechecked until the desired watts loss is achieved.

One end cap shall then be unsoldered, a standard ceramic body fitted, the cavity filled and the cap end resoldered in position making sure the shoulder of the element is butted to the inside face of the end cap (the ceramic body shall not interfere with this condition). (See Figure 19(d)).

The watts loss shall be rechecked in accordance with A.2 and adjusted if necessary.

The resulting calibrated link shall be marked 'NOT A FUSE' on the ceramic body.

A.2 Calibration

The calibration jig shown in Figure 20 is mounted horizontally 25 mm above a wooden board by means of two ceramic pillars. A fine wire thermocouple is attached to the centre of each fuse contact clip, on the outside of the top edge, in such a way that it does not interfere with the contact area. The thermocouples are taken out of the box in slots cut in one end of the jig base, the width of the slots just being sufficient to accept the diameter of the thermocouples. The connection to the jig base shall be by means of PVC insulated single-core copper cables, 0.3 ± 0.05 m in length and 2.5 mm^2 cross section. The surroundings shall be free from draughts and the ambient air temperature, measured by a suitable thermometer or thermocouple at a horizontal distance of 1 m to 2 m from the standard link, shall be in the range of 15° C to 25° C. The standard link shall be inserted into the clips provided in the calibration jig and the cover replaced. A current of 13 A is then passed continuously through the calibrated link for 1 h. At the end of this time the temperatures measured by the thermocouples are noted, the cover of the jig is then removed and the millivolt drop between the end surface of the end caps of the calibrated link is measured whilst it is still carrying the test current. Alternative current shall be used for the calibration.

The calibration is considered to be correct when:

(a) the product of the measured millivolt drop multiplied by the test current gives a result of $1 \begin{smallmatrix} +0.00 \\ -0.05 \end{smallmatrix}$ W;

(b) the temperature difference between the end caps does not exceed 2° C.

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

APPENDIX B

B.1 For non-solid pins push a probe of 0.2 mm diameter of steel complying with table 1 of BS 5216 : 1991 into all seams and joints. Check that the test pin does not enter into any seam or joint to a depth greater than the thickness of the material from which the plug pin is formed.

B.2 For non-solid pins position a pin on the fixed anvil of the apparatus, as shown in Figure 22, with its contact surfaces in the horizontal plane. Bring the moveable anvil to rest against the upper surface of the pin. This quiescent position shall be taken as the datum point. Apply a mechanical load to the movable anvil by any convenient method such that the pin is strained at a rate of 10 mm/min. Measure the applied load when the movement of the anvil from the datum point reaches 1.5 mm. The test shall be made separately on the line, neutral and earth pins applying the load perpendicular to the major axis surfaces of the pins. If there is a joint or seam in one of the major axis surfaces of a pin then the test shall be made twice. The seam or joint shall face the moving anvil for the first test and shall face the fixed anvil for the second test. The load shall not be less than 1100 N.

B.3 For non-solid pins position a pin on the fixed anvil of the apparatus, as shown in Figure 22, with its contact surfaces in the horizontal plane. Bring the movable anvil to rest against the upper surface of the pin.

Apply a mechanical load of 800 N to the movable anvil 50 times without impact.

The test shall be made separately on the line, neutral and earth pins applying the load perpendicular to the major axis surfaces of the pins. If there is a joint of seam in one of the major axis surfaces of a pin then the test shall be made twice. The seam or joint shall face the moving anvil for the first test and shall face the fixed anvil for the second test.

After the test the plug shall enter the gauge shown in Figure 5 with a force not exceeding 5N.

B.4 For plugs with non-solid pins, carry out the test described in 18.1.2 using three difference types of single unswitched socket-outlets. One type shall have the shutters operated by the line and neutral pins, the other two types shall be operated by the earth pin. Of these two types one shall have a shutter operating ramp of metal and the other of plastics.

B.5 For solid pins, position a pin on the fixed anvil of the apparatus, as shown in Figure 22, with its contact surfaces in the horizontal plane. Bring the movable anvil to rest against the upper surface of the pin. The quiescent position shall be taken as the datum point. Apply a mechanical load of 1100 N to the movable anvil by any convenient method such that the pin is strained at a rate of 10 mm/min. The test shall be made separately on the line, neutral and earth pins applying the load perpendicular to the major axis surfaces of the pins.

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

TABLE 1

TEST SCHEDULE		
Test	No of Samples	Order of tests (clause reference)
Plugs Inspection, measurement, gauging and manipulation	3	5.1, 4, 6.2, 7.1, 7.2, 7.3, 8.1, 9.1, 9.2, 9.4, 12.1, 12.2, 12.3, 12.4, 12.5, 12.9, 12.13, 12.14, 12.15, 12.16, 16.2, 18.1, 18.2, 11.2
General	3	5.1, 9.3, 18.2, 10, 14.1.3, 16.1, 12.12, 12.17.2, 12.17.3, 12.17.2
	3	5.1, 13.2, 14.1.2, 14.1.3, 12.8, 14.2, 16.3, 12.17.4
	3	5.1, 13.1, 14.1.2, 14.1.3, 15.1.2, 17.1.2, 12.10, 17.1.3, 12.6, 12.11, 18.2, 15.1.2, 12.7, 8.2
Material	3	5.1, 19.1.2, 9.1, 14.1.3, 19.2
	3	5.1, 19.1.3, 14.1.2(b)(1), 14.1.3, 19.2,
	3	5.1, 20.1, 20.2
	3	5.1, 20.3, 18.2, 21.1, 21.2
	3	12.9.6, B1#, B2#, B3#, B5+

Plugs with non-solid pins only

+ Plugs with solid pins only

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

TABLE 2

CURRENT, FUSE RATING AND LOAD FOR FLEXING AND CORD GRIP TESTS RELATED TO SIZE OF FLEXIBLE CORD					
Flexible cord size	Rated current	Test current	Fuse rating	Load for flexing test	Load for cord grip test
mm	A	A	A	N	N
0.50	3	3.5	3.(5)*	10	30
0.75	6	7	13	10	30
1.00	10	11	13	20	30
1.25	13	14	13	20	60
1.50	13	14	13	20	60

*The figure in brackets indicates the fuse rating when a non-rewireableplug/cord assembly is used within certain types of equipment where the use of a 5 A fuse-link is necessary because of the high instantaneous input current.

TABLE 3

PERMITTED TEMPERATURE RISES	
Measurement point	Temperature rise
	K
Line plug pin spacer (see Figure 17)	35
Neutral plug pin spacer (see Figure 17)	35
Terminations (portable plugs only)	50
Accessible external surface	50

TABLE 4

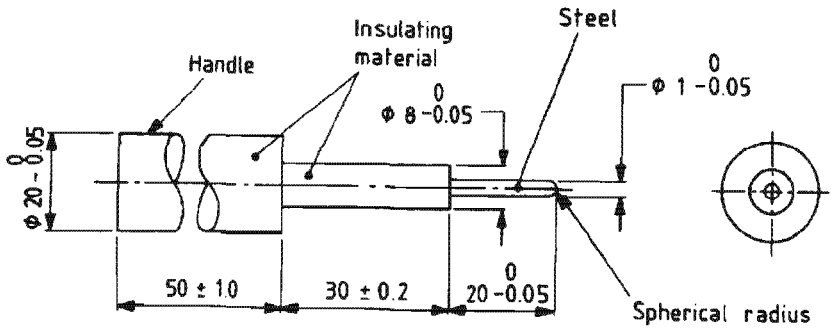
CONNECTION OF FLEXIBLE CORDS		
Termination	Conductor insulation colour	
	2-core	
	Colour coded complying with BS 6500	Cords given in Table 14 of BS 6500
Earthing	No connection	No connection
Live	Brown	As supplied
Neutral	Blue	As supplied

TABLE 5

APPLICATION OF GLOW-WIRE TEST		
Part	Temperature of glow wire	
	Portable accessories	
	C	
Parts necessary to retain live parts in position	750	10
Parts not necessary to retain live parts in position (although they may be in contact with live parts)	650	10

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

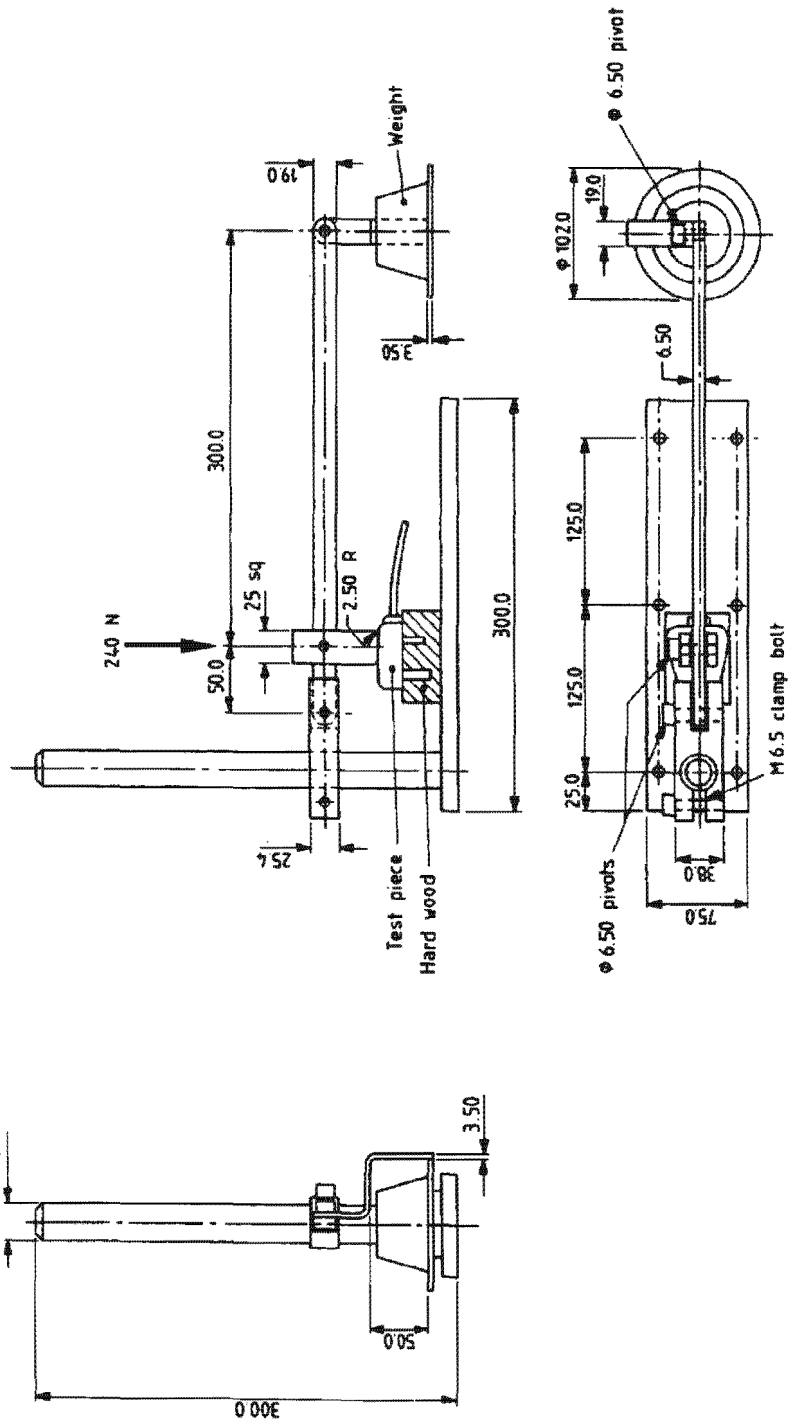
FIGURE 1 **TEST PIN**



All dimensions are in millimetres

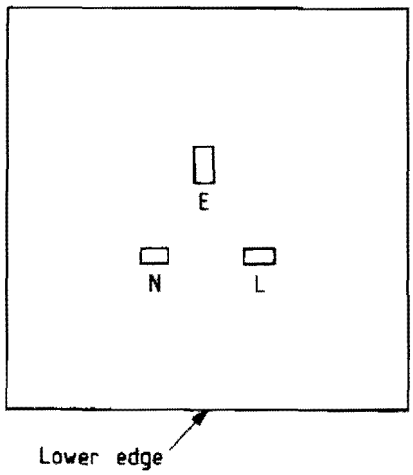
Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 2 | **APPARATUS FOR MECHANICAL STRENGTH TEST ON RESILIENT COVERS**



NOTE: **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

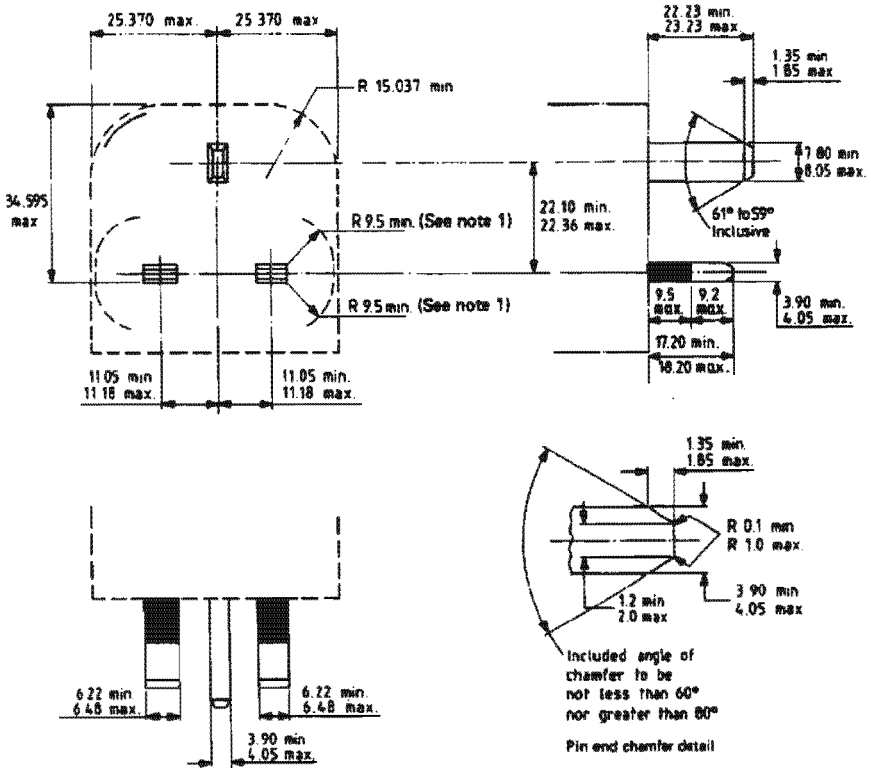
FIGURE 3 | **IDENTIFICATION OF CONTACTS**



NOTE | **The diagram shows the disposition of the socket-contacts as viewed from the front of a socket outlet**

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

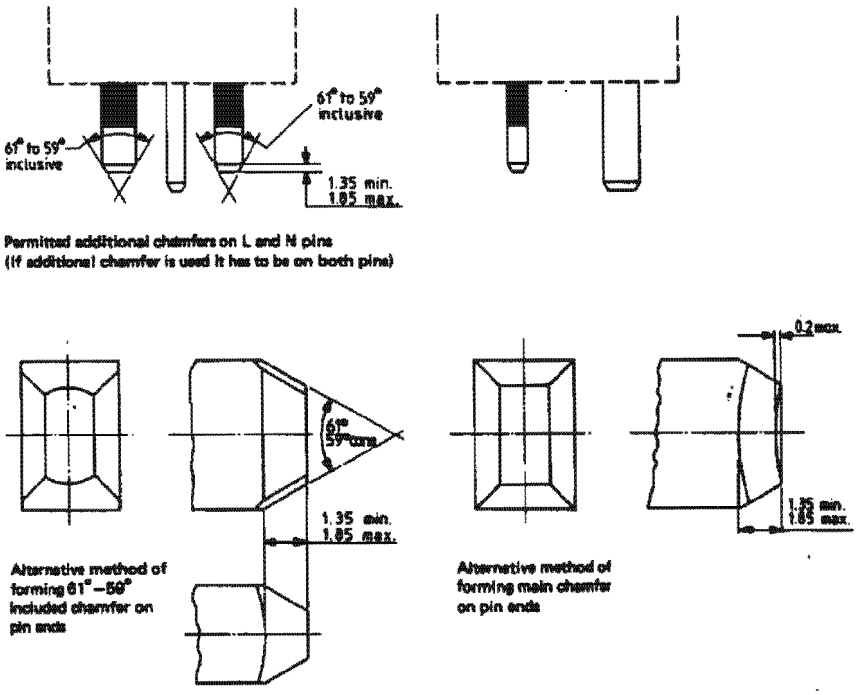
FIGURE 4 **DIMENSIONS AND DISPOSITION OF PLUG PINS AND MAXIMUM OUTLINE OF PLUG**



All dimensions are in millimetres

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 4 (CONCLUDED)



All dimensions are in millimetres

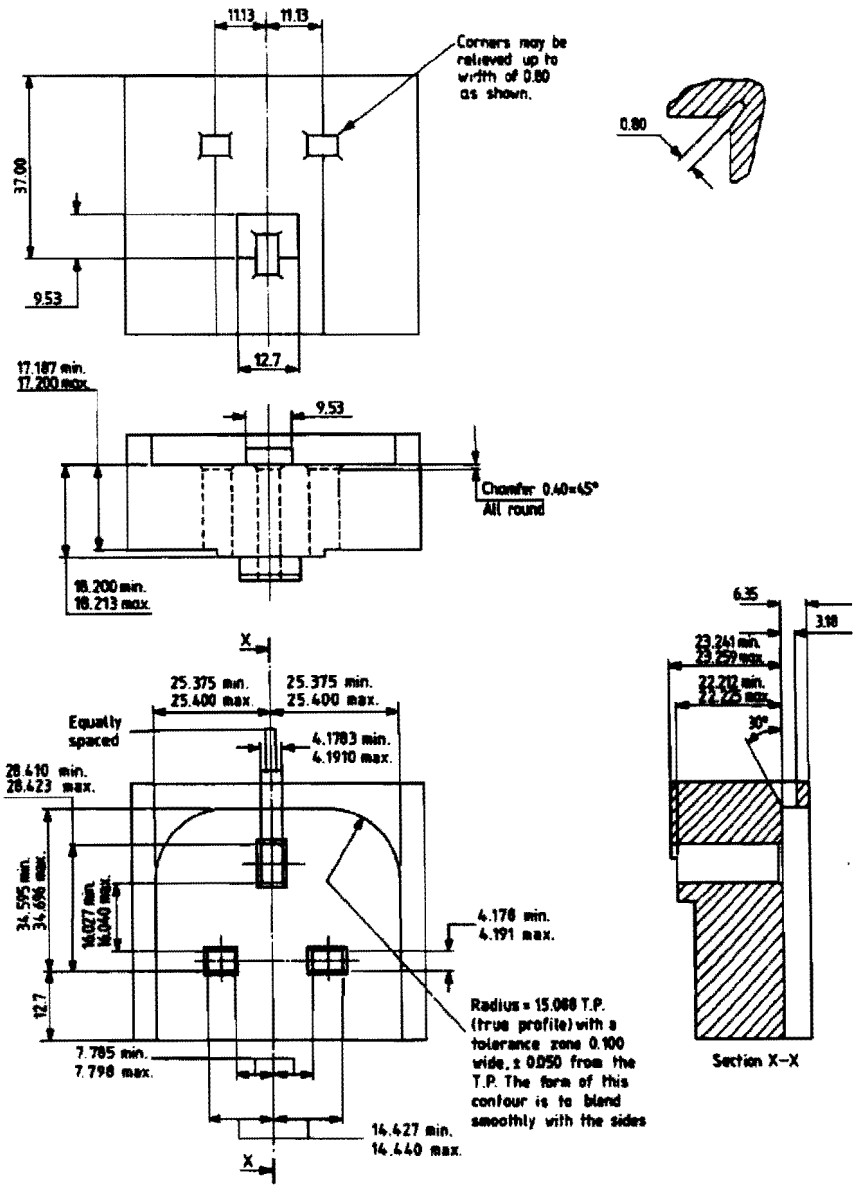
NOTE 1 **See 12.3**

NOTE 2 **External edges of plug pins are to be free from burrs or sharp edges and may have a radius not exceeding 1 mm.**

NOTE 3 **The surfaces of plug pins are to be flat within the specified tolerances.**

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

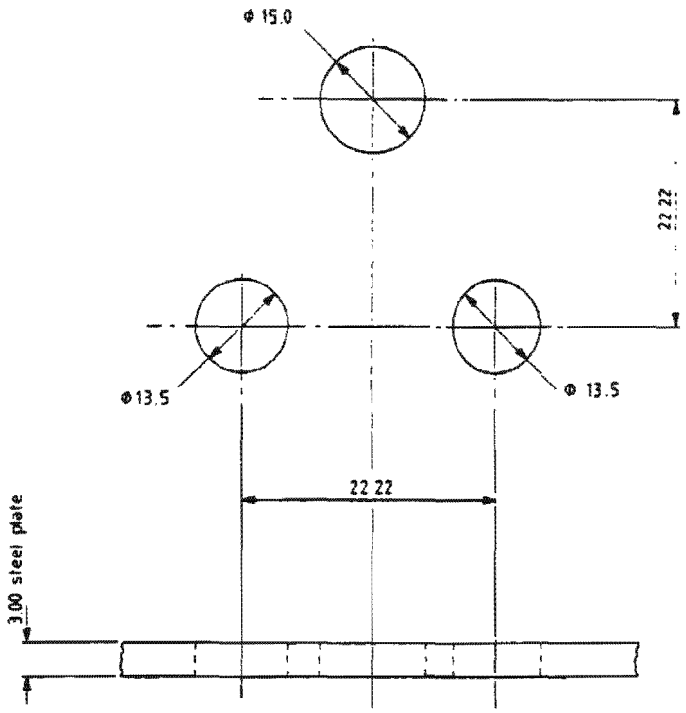
FIGURE 5 | **GAUGE FOR PLUG**



Dimensions not given as maximum or minimum are nominal dimensions.

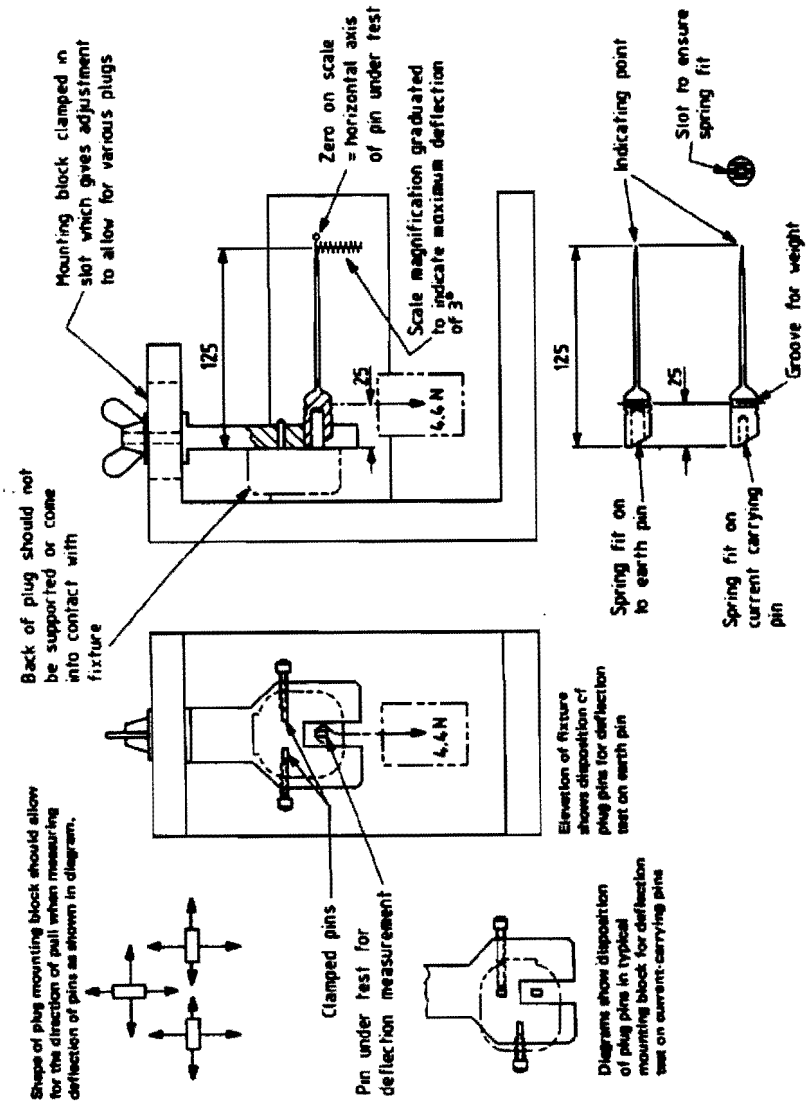
All dimensions are in millimetres

FIGURE 6 | **MOUNTING PLATE**



All dimensions are in millimetres

FIGURE 7 | **PLUG-PINS DEFLECTION TEST APPARATUS FOR RESILIENT PLUGS**

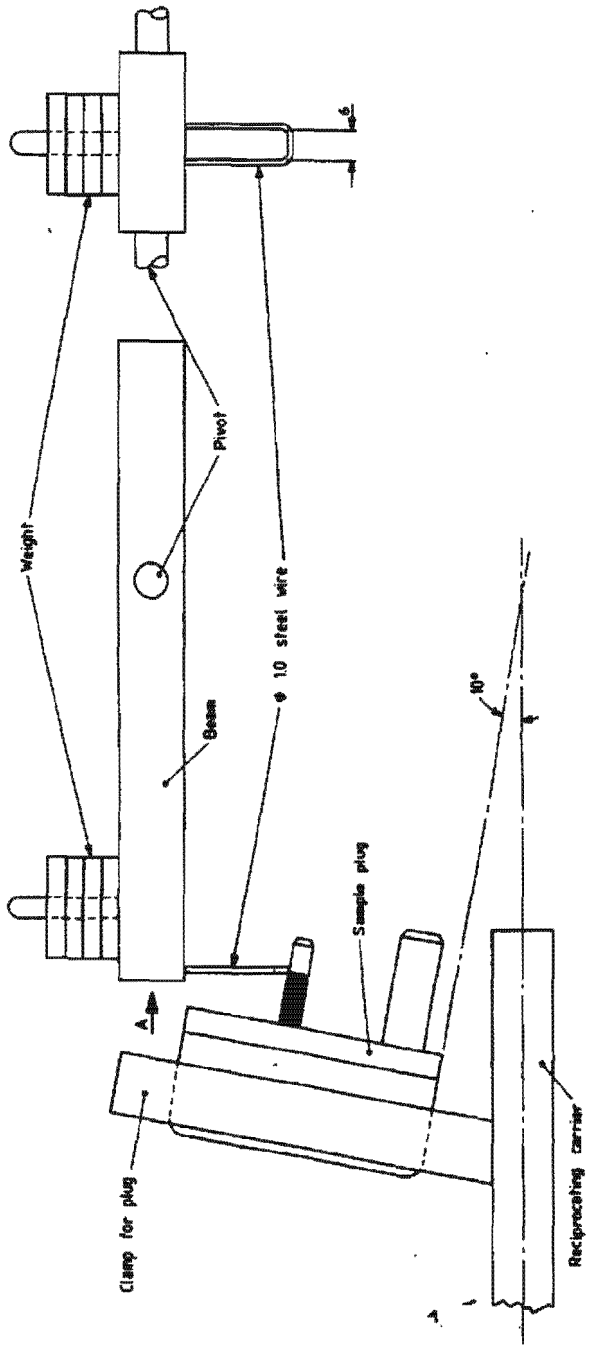


All dimensions are in millimetres

NOTE 1 **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

NOTE 2 **Indicators manufactured from material of negligible weight such as aluminium.**

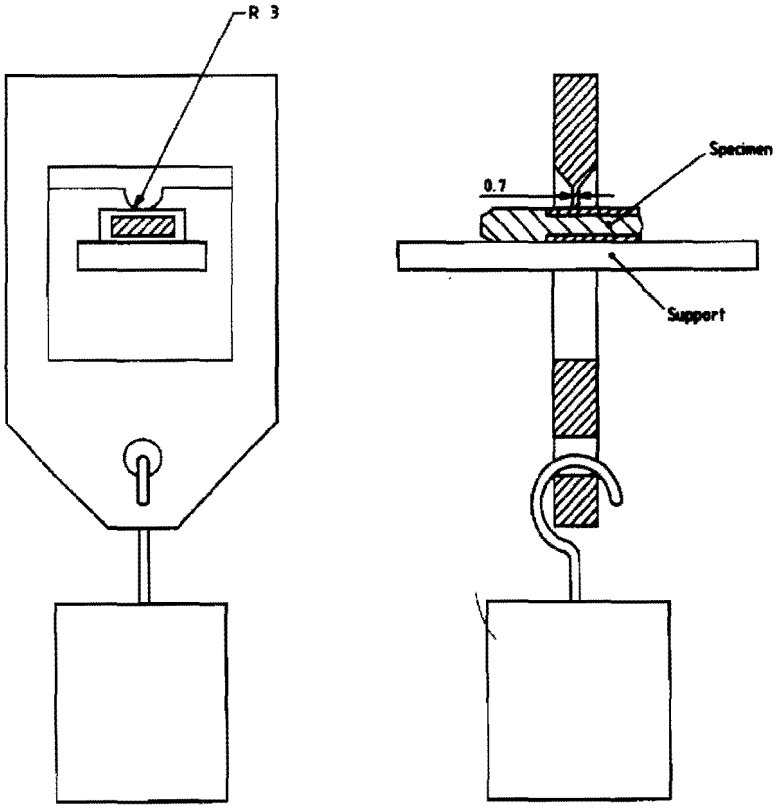
FIGURE 8 **APPARATUS FOR ABRASION TEST ON INSULATING SLEEVES OF PLUGS (SEE 12.17.3)**



All dimensions are in millimetres.

NOTE **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

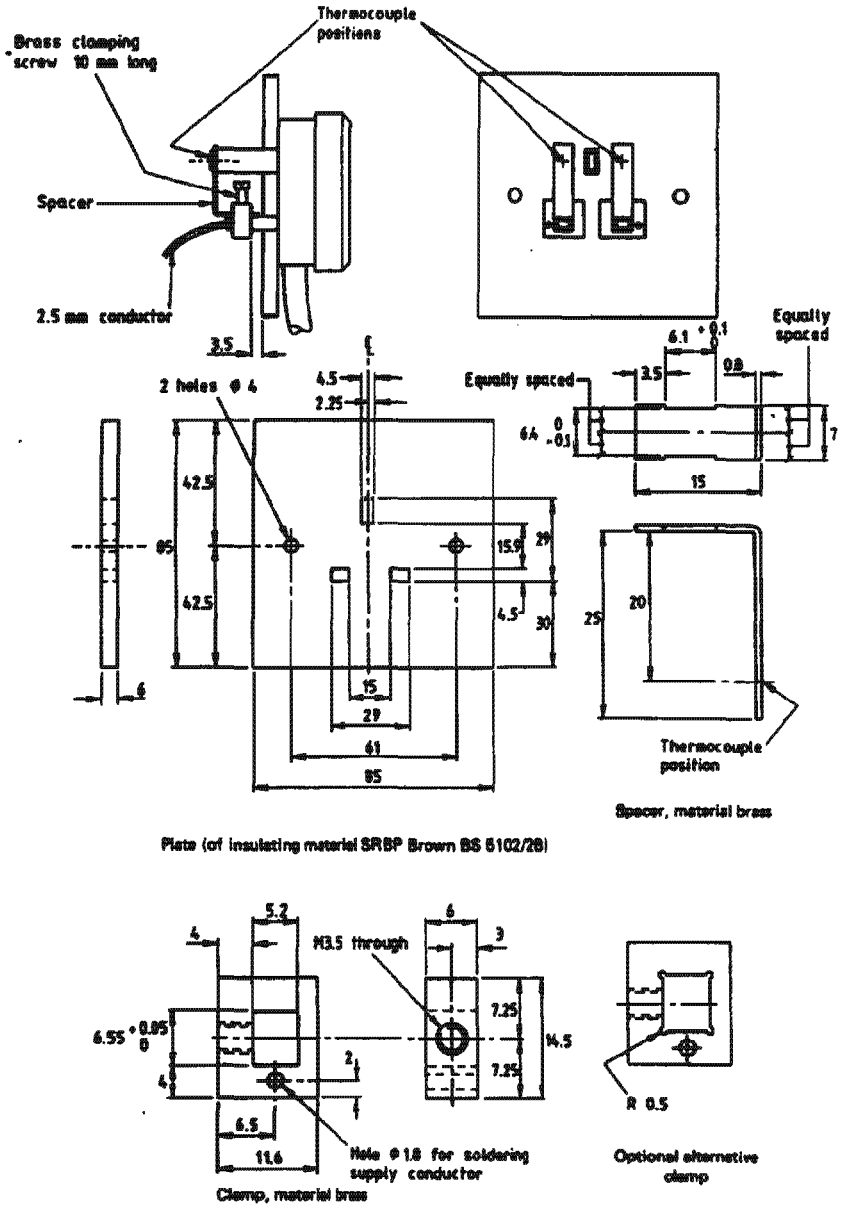
FIGURE 9 **APPARATUS FOR PRESSURE TEST AT HIGH TEMPERATURE**



NOTE **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

All dimensions are in millimetres.

FIGURE 10 | **DUMMY FRONT PLATE FOR 13 A SOCKET-OUTLET**

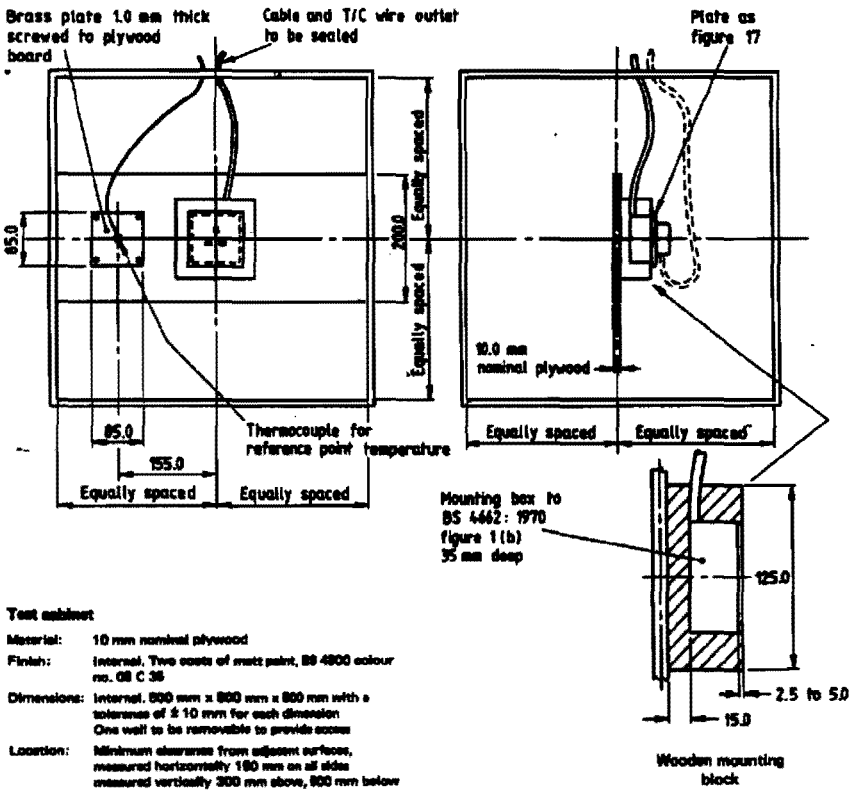


All dimensions are in millimetres

NOTE | **Tolerance ± 0.1 mm except where shown.**

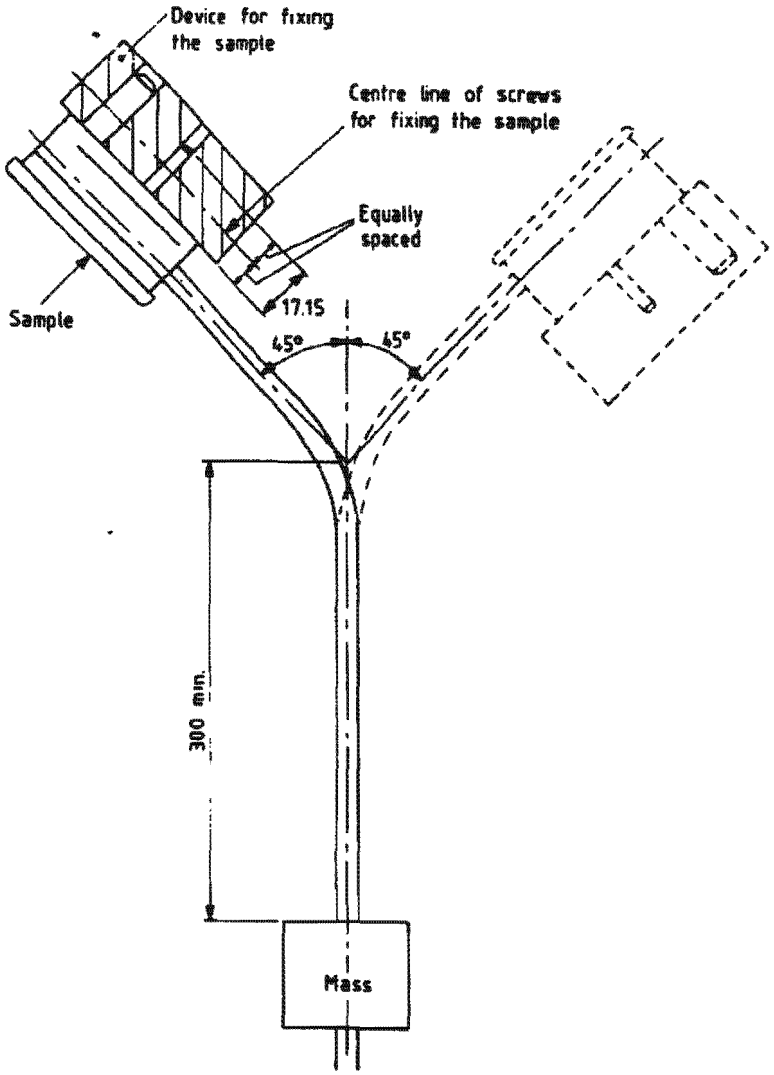
Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 10 (a) **APPARATUS FOR TEMPERATURE RISE TEST**



All dimensions are in millimetres

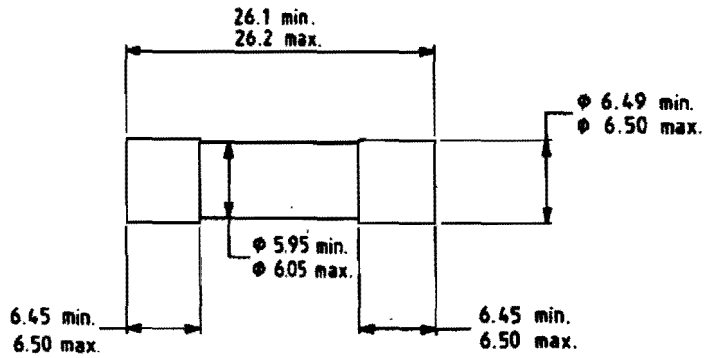
FIGURE 11 | **APPARATUS FOR FLEXING TEST**



NOTE | **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

All dimensions are in millimetres.

FIGURE 12 | **SOLID LINK FOR TEST ON FUSE CLIPS**

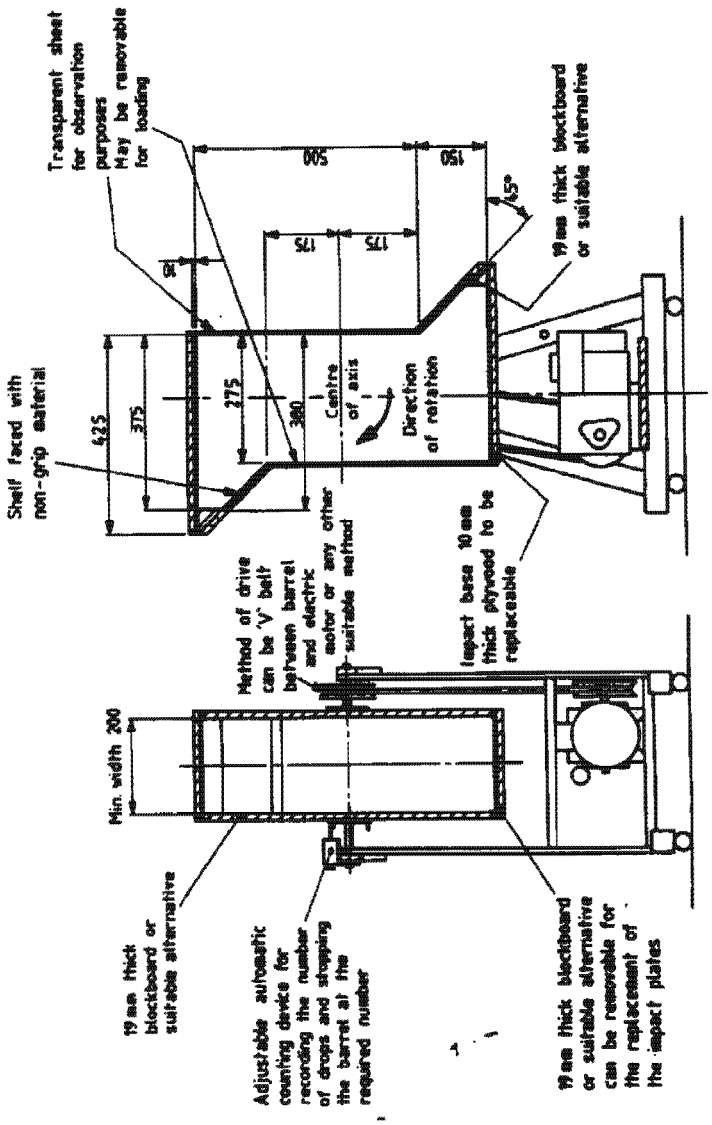


NOTE | **Finish: polished and sharp corners removed.**

All dimensions are in millimetres.

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 13 **TUMBLING BARREL**

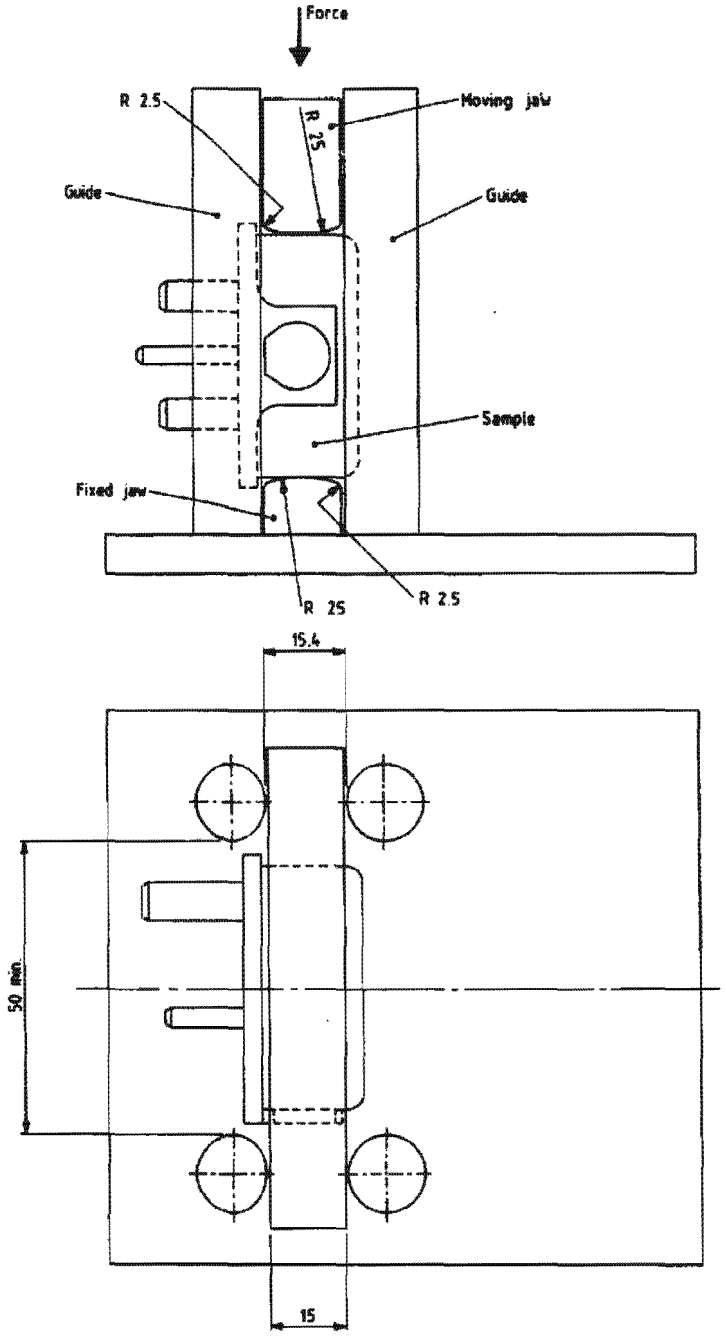


NOTE **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

All dimensions are in millimetres.

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

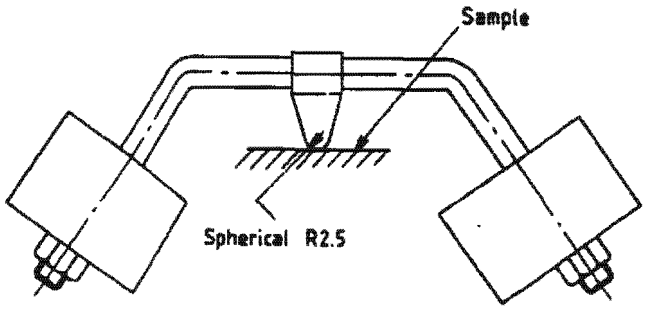
FIGURE 14 | **APPARATUS FOR PRESSURE TEST ON PLUGS**



All dimensions are in millimetres

NOTE **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

FIGURE 15 | **BALL PRESSURE TEST APPARATUS**

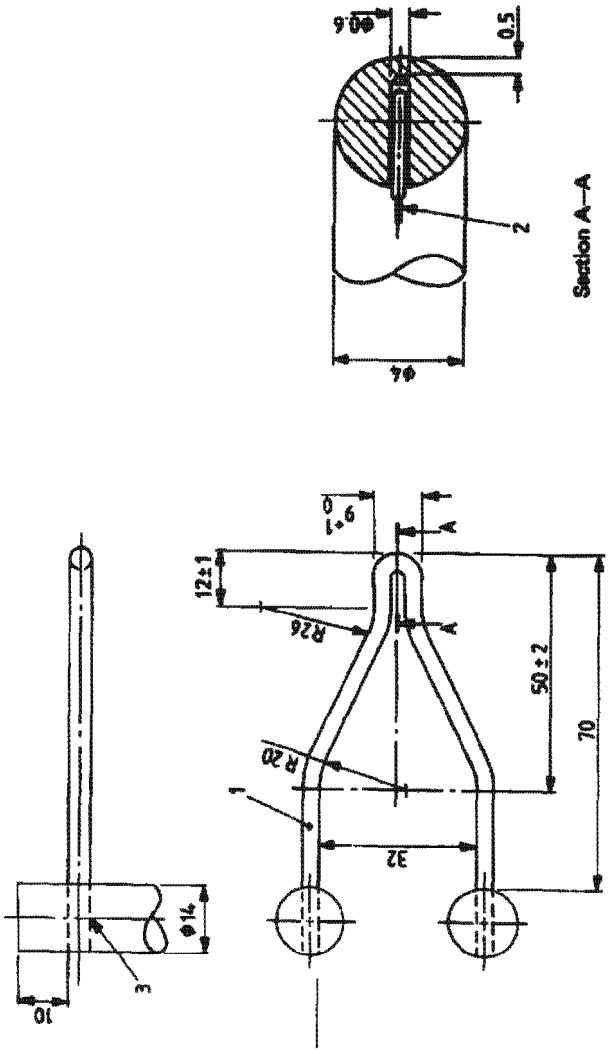


NOTE | **This drawing is not intended to govern design except as regards the dimension and specific requirements shown.**

All dimensions are in millimetres.

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 16 | **GLOW WIRE WITH THERMOCOUPLE**



KEY

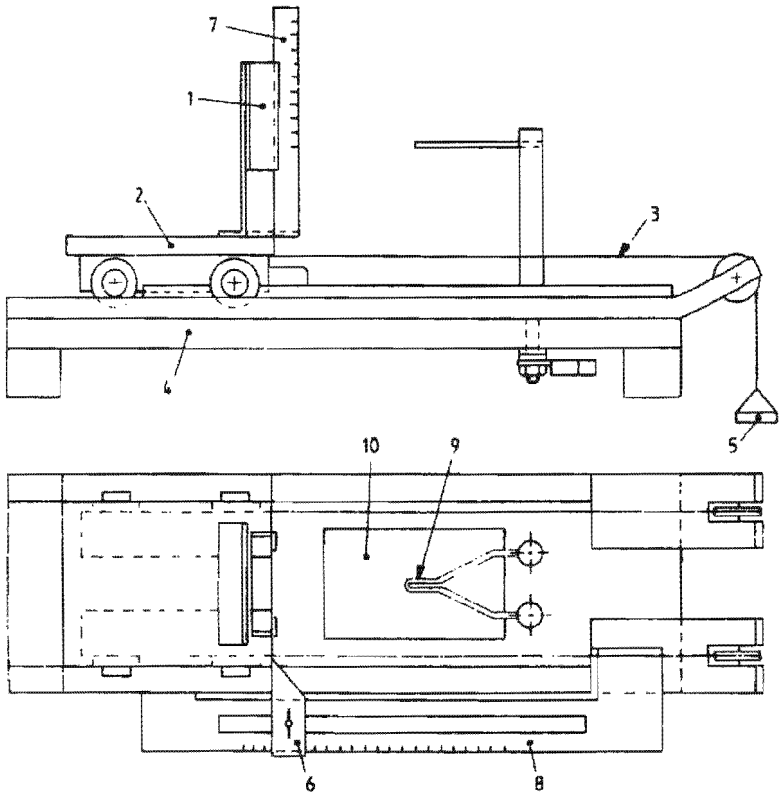
1 Glow wire, brazed to 3

2 Thermocouple

3 Brass studs (37% Cu)

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 17 | **GLOW WIRE TEST APPARATUS**

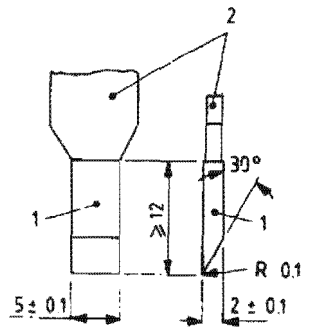


KEY

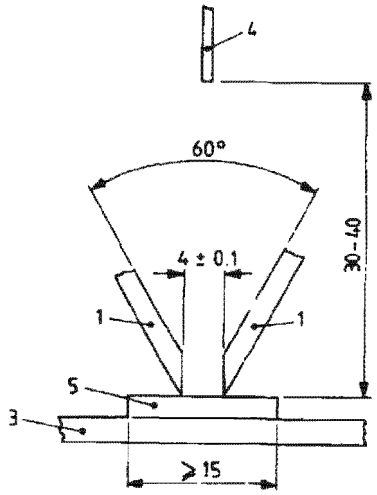
1 Support for sample
2 Carriage
3 Pulling string
4 Base plate
5 Weight
6 Adjustable stop
7 Scale for flame height
8 Scale for depth of penetration
9 Glow wire with thermocouple
10 Opening in base plate to pass molten or glowing particles

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 18 **ARRANGEMENTS AND DIMENSIONS OF THE ELECTRODES FOR THE TRACKING TEST**



(a) Electrode



(b) Electrode arrangement

All dimensions are in millimetres.

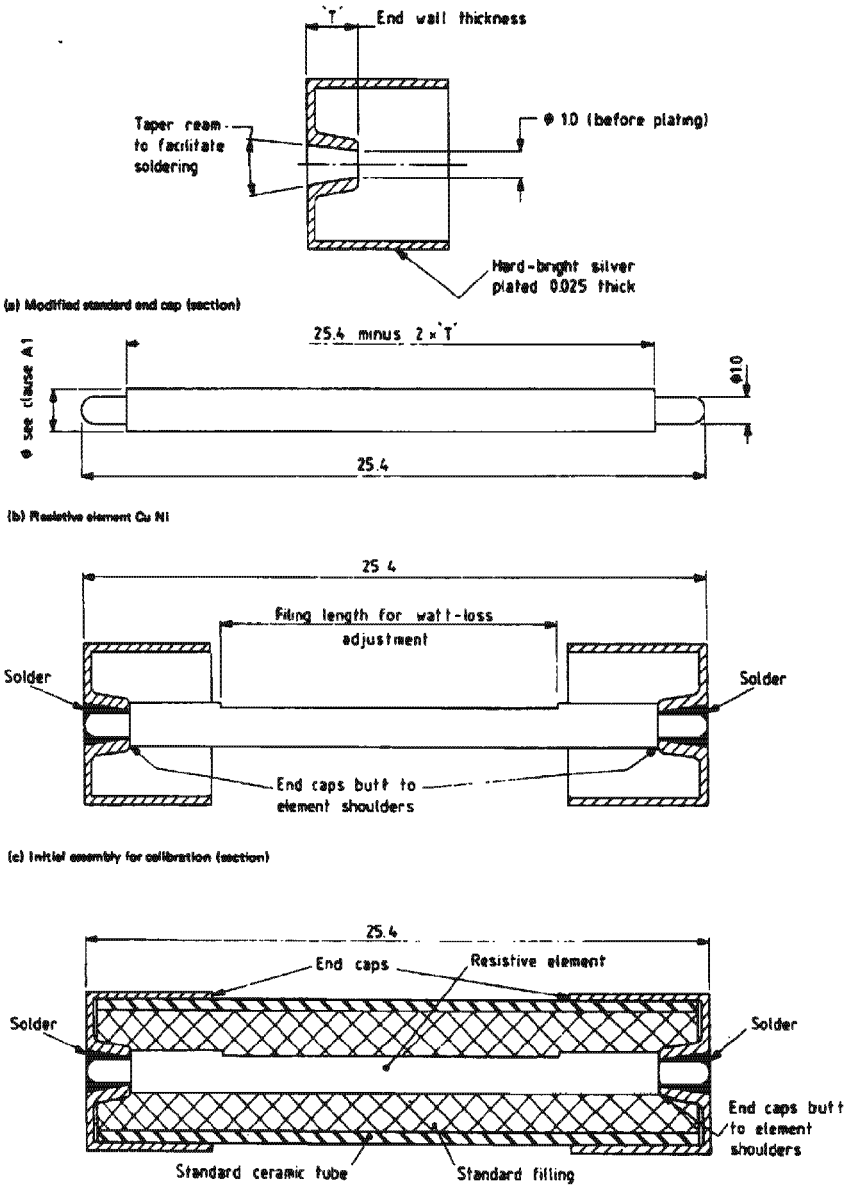
KEY

1 Platinum electrode
2 Brass extension
3 Support
4 Tip of dropping device
5 Specimen

All dimensions are in millimetres

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 19 **CALIBRATED LINK**



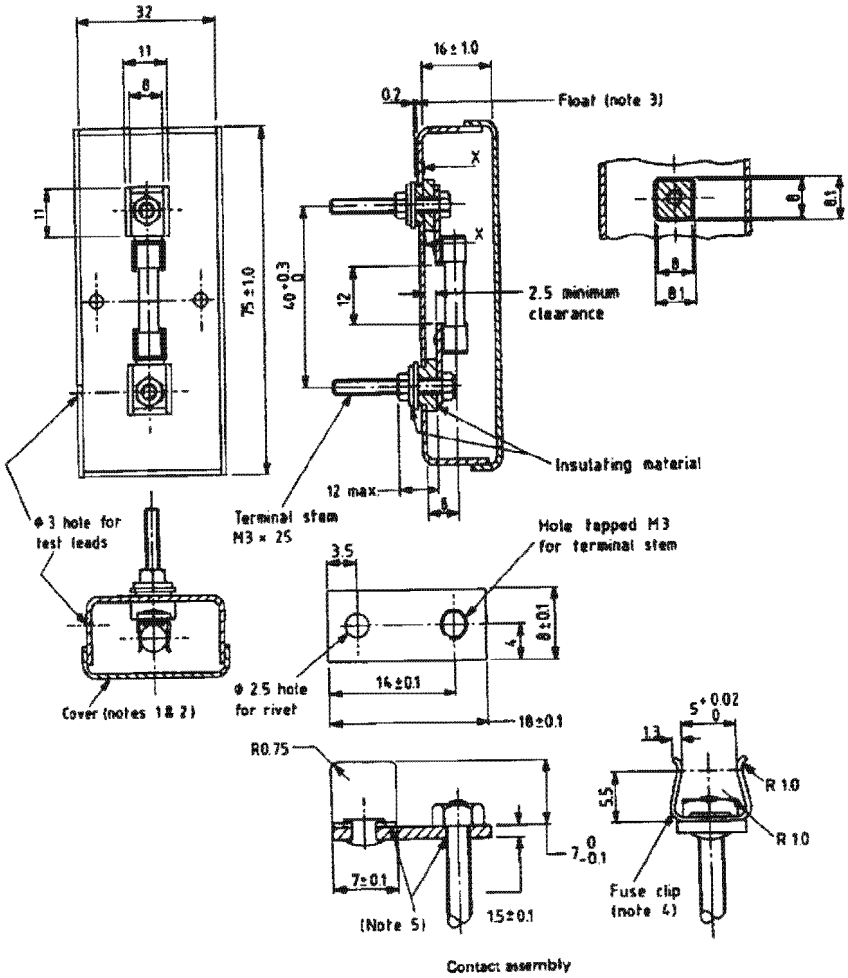
(d) Assembled link (section)

All dimensions are in millimetres

NOTE **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 20 | **CALIBRATED JIG FOR CALIBRATED LINK**



All dimensions are in millimetres

NOTE 1 **Box and cover made from 1.25mm brass sheet, clean natural finish.**

NOTE 2 **Cover should be a push fit on box and should not be rigidly asttached.**

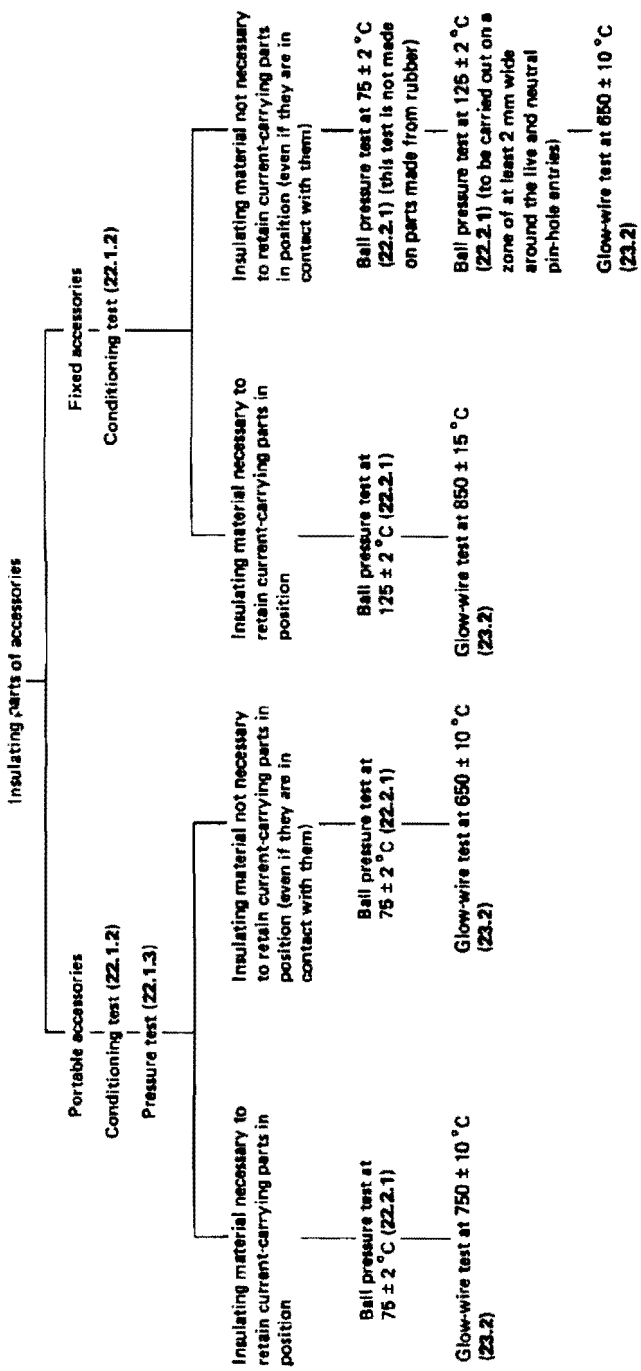
NOTE 3 **The end float and clearance between the insulation and the box is to allow the contacts to be self-aligning.**

NOTE 4 **Cable sockets for 2.5mm^2 cable for power loss test.**

NOTE 5 **Fuse clip. Made from beryllium copper 0.45mm thick and heat treated (170 HV minimum). Base of clip to be flat; finish, silver plated.**

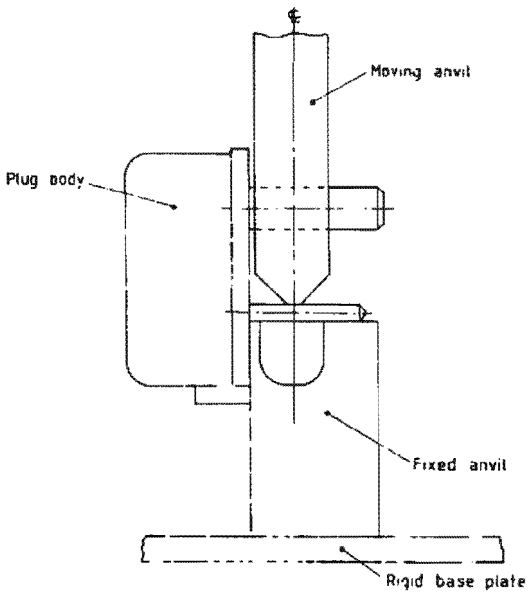
NOTE 6 **Joints between clip, contact plate and terminal stem to be soldered.**

FIGURE 21 **DIAGRAMMATIC REPRESENTATION OF TESTS OF INSULATING PARTS OF PLUGS**



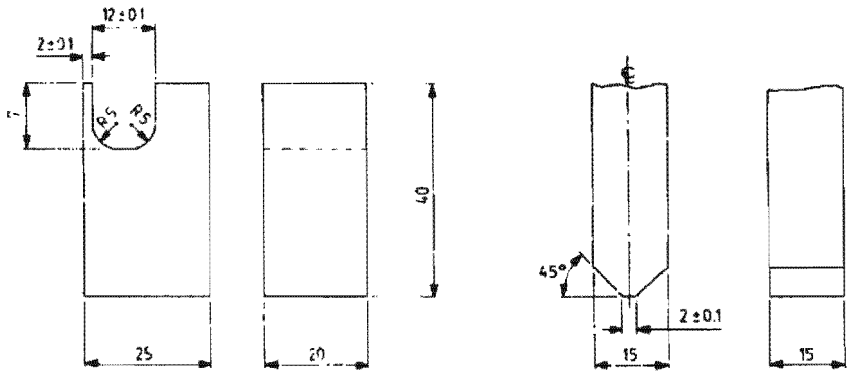
Non-Rewireable 13A Plugs with Plastic Socket Shutter Opening Pins

FIGURE 22 | **APPARATUS FOR TEST ON PLUG PINS**



(a) A plug-pin under test.

NOTE. The body of the plug should be supported so that the face of the plug is held in contact with the face of the fixed anvil.
The moving anvil should be aligned in the centre of the gap in the fixed anvil.



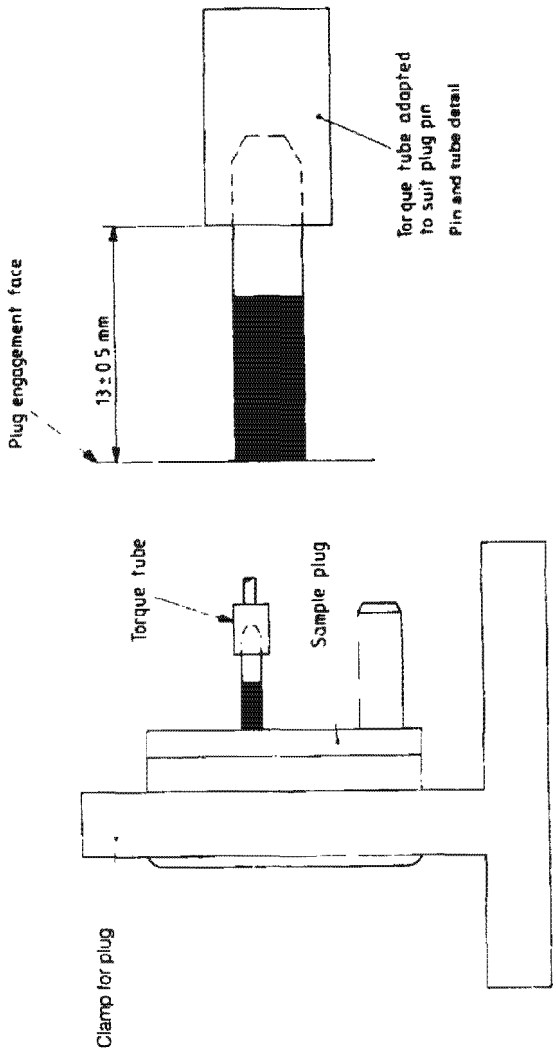
(b) Details of anvils

All dimensions are in milimetres

NOTE 1 **The material is of hardened steel.**

NOTE 2 **This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.**

FIGURE 23 | **APPARATUS FOR TESTING PLUG PIN DISTORTION BY TWISTING**



All dimensions are in millimetres